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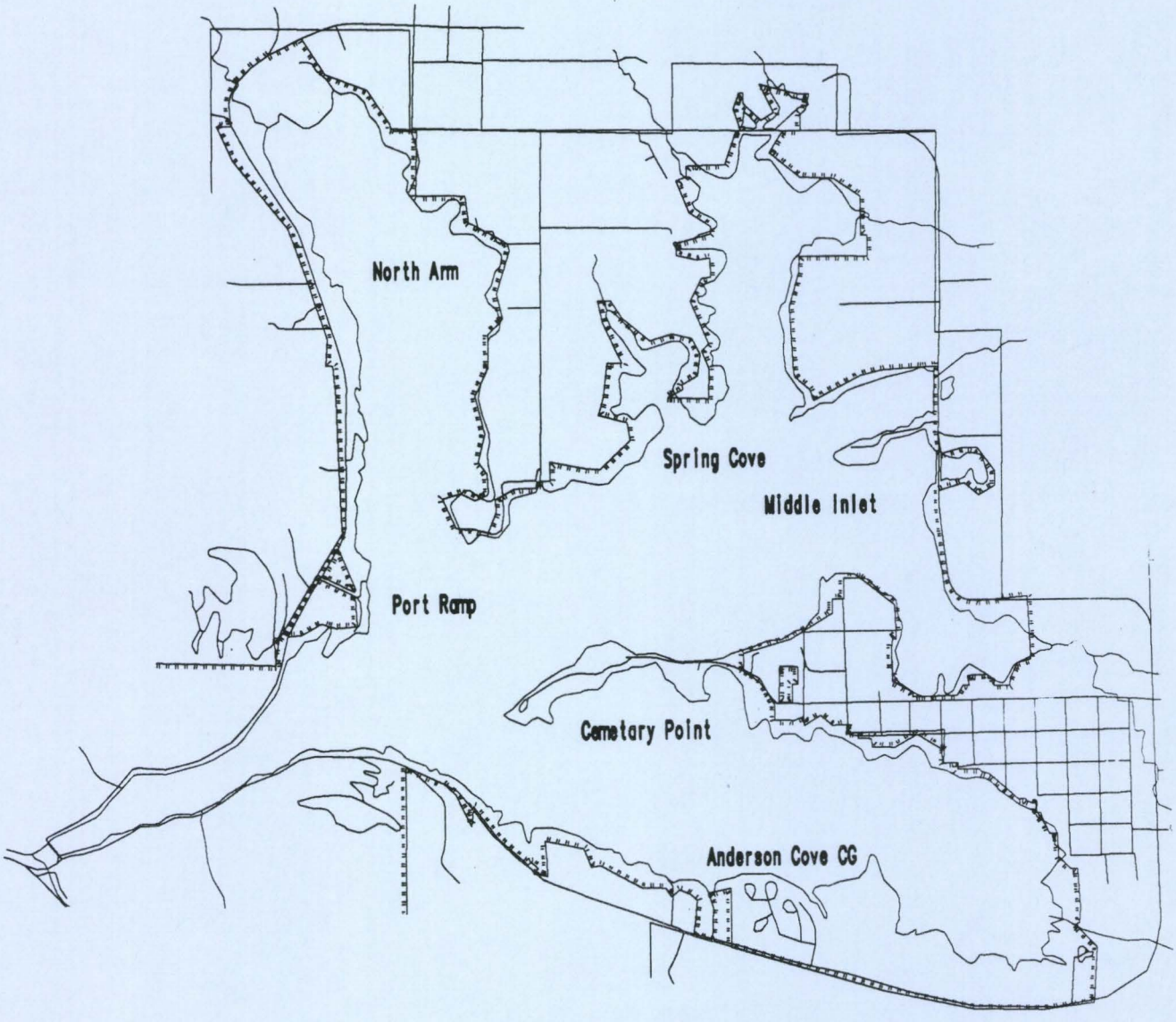
Boating Capacity Review and Determination for Pineview Reservoir



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Boating Capacity Review
and
Determination for Pineview Reservoir

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Weber County, Utah

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Abstract & Executive Summary

ABSTRACT

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Title: Boating Capacity Review and Determination for Pineview Reservoir

Abstract: Pineview Reservoir is a heavily used (500,000 visits/year) recreation/irrigation reservoir located adjacent to the Wasatch Front urban area. Maximizing the boating capacity of the reservoir to provide recreation opportunities while maintaining public safety and perceptions of a quality recreation experience is the management challenge the Forest Service faces.

Reservoir managers feel the allowed numbers in the current carrying capacity policy are too high in order to effectively increase public safety and decrease boating congestion. This study takes a closer look at the carrying capacity literature, recalculates useable acres and make recommendations on revising the carrying capacity for Pineview Reservoir.

Useable acres on Pineview Reservoir were calculated from a digitized depth map of the reservoir using Arc/Info software. Maps and presentation materials were all formatted using this GIS technology.

Carrying capacity scenarios were developed from application of standards for acres per boat to the useable acres on the reservoir. Several recommendations are made on the choice of a suitable boating standard. A new boating capacity on Pineview Reservoir is proposed.

In order to implement a revised carrying capacity, a set of policies for managing the reservoir capacity dealing with law enforcement, launch procedures, use of facilities and reciprocal agreements between facilties is recommended.

Keywords: Recreation Carrying Capacity, Boating Capacity, Boating, Reservoir Management, Geographic Information Systems

EXECUTIVE SUMMARY

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Summary: Pineview Reservoir is a heavily used (500,000 visits/year) recreation/irrigation reservoir located adjacent to the Wasatch Front urban area. Maximizing the capacity of the reservoir to provide recreation opportunities while maintaining public safety and perceptions of a quality recreation experience is the management challenge the Forest Service faces.

This paper reviews past capacity decisions, examines the carrying capacity literature, estimates physical carrying capacities and makes recommendations on revising the boating capacity policy for Pineview Reservoir.

Recreational carrying capacity is a level of use beyond which impacts exceed predetermined evaluative standards. It considers both the physical world and the social interaction of people. Recreational carrying capacity depends heavily on management setting objectives for desired recreation experience outcomes. As such there is no one carrying capacity, there will be a range of capacities depending on the corresponding management objectives of the area. A listing of boating standards used in other parts of the country is provided.

The Ogden District has made three previous attempts to establish a carrying capacity for the reservoir. The previous effort in 1992 created some special zones and set a new limit based on rough acreage calculations. The current study refines this effort by using a geographic information system (GIS) to calculate areas within each zone and apply different boating capacity standards to determine allowed number of boats.

Four alternatives were developed to address the effects of applying a range of boating standards to Pineview Reservoir. One closely approximates the current capacity limit (7.5 acres/boat). Two others apply common standards for power boating (15 acres/boat) and water skiing (30 acres/boat). The final alternative examines the effect of a standard at the extreme (40 acres/boat).

The current policy alternative displayed a weakness in the existing policy. The shoreline effect, that water near the edge of the reservoir is not useable, was not adequately factored into the allowed number of boats. A difference of 100 boats was observed at the 4890 water level. The assumption on reducing 50 boats per

10' drop in water level was validated. Other effects will be determined this summer as the policy is implemented.

The remaining alternatives showed large drops in allowed boat numbers. Implementing these alternatives would have profound effects on visitors to Pineview Reservoir. Limits would be reached every weekend and most weekdays during the peak season with the standards in these alternatives.

A revised capacity proposal is offered which corrects the weakness of the existing policy. It draws from the current policy alternative but rounds the numbers to provide for efficient administration and to aid public understanding. The new limits are shown below.

Pineview Reservoir Capacity Limits, No. of Vessels at One Time

Water Level	Boat Ramps	Yacht Club
4900	400	30
4890	300	25
4880	250	20
4870	200	15
4860	150	10
4850	100	10

A set of policies is provided to implement the proposed revised capacity. Launches would be on a first come - first served basis. Data forms to track use levels are included. A set of actions to implement the policy are outlined.

This study has highlighted some additional areas to explore that can affect capacity. Analyzing the results of the CUSTOMER survey performed in 1992 will help managers better understand the visitors at Pineview. Clarifying the management objectives for the reservoir is an essential task to be accomplished in the future. Buying water shares, purchasing additional land around the reservoir, developing attractions to disperse visitors and eliminating conflicting commercial uses are also discussed.

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III. INTRODUCTION

A. Purpose and Need

Pineview Reservoir is a heavily used recreation/irrigation reservoir with over 500,000 visits annually. Its location adjacent to the Wasatch Front urban area and its amenity attractions ensure that future high levels of use will continue. Current levels of boating use, increasing boat size, changing patterns of boating use, new types of boating craft and congestion at key attractions all contribute to the need to adjust boating policy on Pineview Reservoir.

Managers generally have several variables they can manipulate. With boating one can change use patterns by relocating facilities or access points, control numbers to reduce impacts, control categories of use by zoning in time or space and regulating certain activities (Jaackson 1989; Tribe 1972). All of these options have been used to one extent or another at Pineview. The focus of this study is regulating the numbers of boats on the water at Pineview Reservoir.

B. Study Objectives

Maximizing the capacity of the reservoir to provide recreation opportunities while maintaining public safety and perceptions of a quality recreation experience is the management challenge the Forest Service faces. The objective of the study is to propose a recreational carrying capacity for Pineview Reservoir for motorized vessels. Recreation carrying capacity is proposed as one method for managing to achieve the desired future condition of a pleasurable boating experience.

This paper unfolds in a series of steps. First, past capacity analysis is reviewed and their limitations are explored in order to produce a better estimate of boating capacity for Pineview Reservoir. An extensive review of the recreation carrying capacity literature is then displayed to show the appropriate standards for types of boating experiences provided at Pineview. Next, physical carrying capacities on the reservoir, based on useable acres, are calculated for various water levels using digital terrain information in a geographic information system (GIS). This aspect of the study gave the author hands-on experience with GIS technology as well as greater flexibility of analysis of different alternative combinations of surface area and boating standards. Finally, a new carrying capacity is proposed and a set of policies to implement the revised limit are outlined.

IV. DESCRIPTION OF THE AREA

A. Location

Pineview Reservoir is located in Weber County in north central Utah approximately 8 miles east of the city of Ogden. Nestled in the Ogden Valley it is surrounded by the Wasatch Mountains. Adjacent to the reservoir are the incorporated town of Huntsville and the hamlet of Eden. Numerous farm homesteads and small housing developments fill Ogden Valley. Figure 1 is a vicinity map of Pineview Reservoir showing major features.

Two highways access the reservoir and neighboring communities. Highway 39 runs through Ogden Canyon from the Ogden city to Pineview Dam and then around the reservoir's southern flank before heading into the Bear River Mountains. The Trappers Loop highway intersects Highway 39 near Huntsville and provides a scenic shortcut to Interstate 84 and connecting routes into the Wasatch Front urban area. This route has created easier access to the reservoir from Davis and Salt Lake counties since it was built in 1989. The majority of reservoir visitors travel these two routes.

B. Reservoir Characteristics

Size and Shape

Built initially in 1937, the reservoir purpose was for flood control of the Ogden River and supply of irrigation water to downstream farmers. Raised to its current size in 1957 the reservoir has a storage capacity of 110,000 acre feet of water.

Pineview Dam spillway is situated at 4900' elevation above sea level. It has depths in excess of 80'. Because it is a manmade reservoir its backwater floods once fertile farm land along the stream courses of the North, Middle, and South fork of the Ogden River. The contours of the surrounding valley lead to a three fingered appearance of the reservoir, almost like a crows foot. Local nomenclature for these features of the reservoir are the North Arm, Middle Arm, South Arm and Neck (leading down Ogden Canyon to Pineview Dam) each corresponding to the drainage feeding that part of the reservoir. The highly convoluted nature of the reservoir shoreline reduces the effective water surface available for boating recreation.

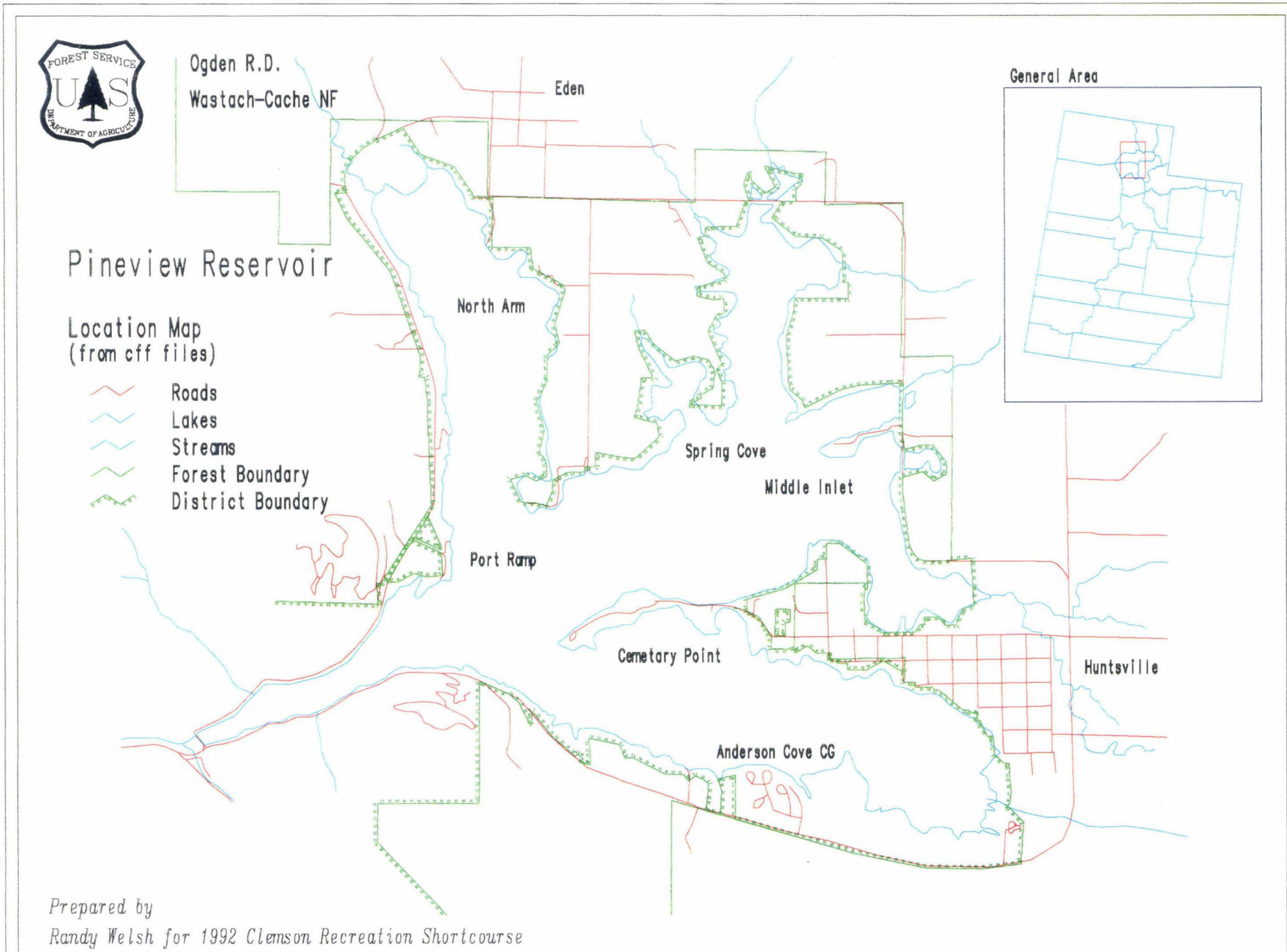
Managing Agencies

Originally, the reservoir project was under the direction of the Bureau of Reclamation. Management of the lands around the reservoir were transferred to the Forest Service in 1963. All the land surrounding the reservoir is acquired National Forest system land.

The State Department of Parks and Recreation stations a Water Ranger on the reservoir during the summer months to enforce state boating laws including boat registration, speed and proximity regulations and boating under the influence of drugs. The State Department of Wildlife Resources manages the fisheries resource.

The water in the reservoir is owned by the Pineview Water Users Association and the Weber Basin Water Conservancy District. These two entities control the flow of water into and out of the reservoir. At this time there is no provision for a sustainable water level for recreation purposes.

FIGURE 1


Ogden R.D.
Wastach-Cache NF
Eden
General Area
Pineview Reservoir
Location Map
(from cff files)
Roads
Lakes
Streams
Forest Boundary
District Boundary
North Arm
Spring Cove
Middle Inlet
Port Ramp
Cemetary Point
Huntsville
Anderson Cove CG
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

Facilities

Recreation facilities around the reservoir include two boat ramps with docks, parking and restrooms, two swim beaches with picnic areas, a 76 unit campground and numerous dispersed walk on access points. A list of public facilities and their people at one time (PAOT) capacities is described in Table 1. All these facilities are currently operated by private concessionaires under special use permit to the Forest Service.

A 100-slip marina is under special use permit to the Pineview Yacht Club, a private organization of boaters. It has a PAOT capacity of 250 people.

Table 1. Public Facilities at Pineview Reservoir

Name	PAOT	Season
Anderson Cove Campground	650	130 days
Jefferson Hunt Campground	145	120 days
Bluffs Swim Area	900	130 days
Middle Inlet Swim Area	250	130 days
Port Ramp	800	160 days
Marina Ramp	300	160 days
North Arm Wildlife Viewing	150	180 days
Pineview Trailhead	100	180 days

Attractive Features

Pineview offers a wide choice of amenity features. Beaches sport fine white sand. Fishing is good and quiet areas abound in small coves and shoreline areas. There is ample wind at the mouth of Ogden Canyon to please windsurfers and sailboaters. The reservoir is often glassy smooth in the mornings which attracts diehard waterskiiers and trick skiiers. Majestic views of the Wasatch mountains are visible including vistas of Mount Ogden to the southwest and James Peak to the north.

Safety Concerns

Safety of boaters and swimmers is a management concern at Pineview Reservoir. During 1990 and 1991, nineteen accidents were reported involving injury and or property damage. Fifteen (15) people were injured, one death was recorded and property damage of $21,000 occurred. These accidents were predominately in July. In addition a large number of citations (200+) are issued each year for items such as vessel registration, noise violations and driving under the influence of alcohol. Driving too fast and too close to other vessels, especially personal watercraft, lack of in-boat observers for water skiiers, under age drivers of personal watercraft and reckless driving constitute other safety problems.

Boating congestion has been a problem at Pineview. The confluence of the three arms of the reservoir around Cemetery Point constricts boats to a narrow area. The popularity of the Point often makes for heavy boating traffic. The District has instituted a wakeless speed zone around most of Cemetery Point which minimizes speed problems near swimmers and other boaters in this popular area. Other areas of the reservoir experience congestion problems only during peak use periods.

C. Use Statistics

Pineview Reservoir is one of the most popular recreation attractions within Weber County. Its proximity to the Wastach Front and the one million people living in the area within 2 hours ensures a constant stream of people to enjoy the boating, swimming, fishing, camping and other recreation pursuits on and around

the reservoir. Over 500,000 people visit the reservoir each year for some type of recreational activity. Over half of the visits involve boating. Table 2 illustrates the percentage of use by major day use activity types at Pineview Reservoir (camping excluded) for 1992.

Table 2. Recreation Activity Types at Pineview Reservoir (Percent of Recreation Visitor Days)

Recreation Activity	Percent of Use
Power Boating	48
Picnicking	16
Swimming/Water Play	12
Water Skiing	9
Fishing	6
Games and Play	5
Windsurfing	1
Other Boating	1
All Other	1

Power boats on the reservoir range from small fishing boats to 32' cabin cruisers. Waterskiing is very popular as are other dragged flotation devices. Personal watercraft are abundant and have been a topic of special concern. A sizeable contingent of sailboats and windsurfers ply the waters at the mouth of Ogden Canyon.

Prior to 1991 use information on the number of boat launches and types of boats was determined through rough estimates and professional guesses. In 1991 and again in 1992 actual launch numbers were gathered at the boat launches during part of the boating season in conjunction with the District analysis of boating capacity.

The 1991 boating season was characterized by fairly normal water levels, starting at high water in the spring and a slow drawdown during the rest of the summer. It is typical of normal boating years and visitor use patterns. Table 3 describes the launch figures for a portion of the 1991 boating season.

The 1992 boating season however was influenced by drought conditions in Northern Utah and fall drawdown while corrective maintenance was performed on the dam structure (Table 4). The season started with water levels significantly reduced (-20' level) and drawdown was faster than anticipated due to warm weather. Visitor numbers fell dramatically early in the season and after the publicity of the implementation of the new boating capacity limits use levels stayed low. The new capacity levels were never exceeded the remainder of the season. By September water levels were so low that boating essentially stopped on the reservoir.

Table 3. 1991 Boat Launch Figures[1] Pineview Reservoir (5/24-9/2)

Number of Boats	Times Per Season
550 +	1
500-550	1
450-500	4
400-450	7
350-400	10
300-350	14
250-300	8
200-250	23
150-200	15
100-150	14
50-100	5

[1] Port and Cemetery Ramps plus Yacht Club estimate

Average weekend: 390 vessels
Peak Day 1991: 560 vessels

Table 4. 1992 Boat Launch Figures[1] Pineview Reservoir (5/3-9/13)

Number of Boats	Times Per Season
350 +	0
300-350	1
250-300	6
200-250	11
150-200	17
100-150	28
50-100	29
0- 50	43

[1] Port and Cemetery Ramps only

Average weekend: 164 vessels
Peak Day 1991: 348 vessels

D. Current Boating Policy

Management of Pineview Reservoir is directed by the Wasatch-Cache National Forest Plan. The general recreation management prescription for the area is:

> Provide a variety of recreational opportunities, emphasizing day use. Protect scenic and watershed values.

Specific management direction for Pineview Reservoir is to "resolve safety problems at Pineview Reservoir." Guidelines suggest that managers "consider the space needs for motorboating, waterskiing, fishing, sailboating, windsurfing and jetskiing."

The current boating capacity on the reservoir is 430 vessels at one time. This includes provision for a public launch of 400 vessels from Port or Cemetery Ramps and a 30 vessel launch during peak use days from the Pineview Yacht Club. Vessels in wet storage at Port Ramp are counted against the public portion of the launch allocation.

As water levels drop there is a corresponding reduction in boating capacity. Beginning with the 4880' elevation (-20' water level) and every 10' thereafter boat numbers are decreased. Boating effectively ends near the 4850 foot level as the boat ramps become unuseable. Table 5 displays the allocation of boats by private and public launch for each water level. Private launch refers boats moored at the Yacht Club.

Table 5. Allocation of Boating Capacity Pineview Reservoir

Water Level	Public Launch	Private Launch[1]
4900	400	30
4880	350	25
4870	300	20
4860	250	15
4850	Ramps Closed	

[1] Yacht Club launch - applies only to peak days

The allocation of boats to the Yacht Club is purely a political decision. This allocation will be considered a given for this analysis. This limit takes effect whenever the boating capacity is reached at the public launch. The Yacht Club enforces the limit with only occasional inspection by the Forest Service.

Parts of the reservoir have been designated for specific types of use. The zones and a description of their purpose is shown in Table 6.

Table 6. Pineview Reservoir Boating Zones

Type of Zone	Reason for Designation
CLOSED	
Bluffs Swim Area	Swimming safety
Middle Inlet Swim Area	Swimming safety
WAKELESS	
Bluffs Swim Area	Congestion, swimming safety
Cemetery Point Ramp	Congestion, docking & launching
Port Ramp	Congestion, docking & launching
Anderson Cove Campground	Congestion, swimming safety
Spring Cove	Fishing, quiet water
The Neck	Fishing, quiet water, windsurfing
The Yacht Club	Congestion, docking

Table 6. Pineview Reservoir Boating Zones (continued)

Type of Zone	Reason for Designation
NONMOTORIZED	
North Arm	Quiet water, fishing, wildlife observation

Zoning provides the opportunity to create certain experiences on the reservoir (Jaackson 1971, 1984). The swim beaches have "Closed" designations to remove contact with boats which increases swimming safety. Around these closures are "Wakeless" zones where boats may pull up on the beaches adjoining the swim areas. "Wakeless" zones are also located at each boat ramp and the Yacht Club where boating congestion dictates low speeds. A special "Wakeless" zone has been designated at Spring Cove in Middle Arm for fishing and social boating use. Another "Wakeless" zone exists in the Neck of the reservoir. Once closed to boating because of concerns of bank erosion from boat wakes this narrow channel has been opened to quiet water boating with great acceptance. Windsurfers flock to this portion of the reservoir to catch the favorable canyon winds. The wakeless designation keeps boating speeds to a reasonable level that minimizes the impact on windsurfers. A "Nonmotorized" zone has recently been established in the shallow end of North Arm to provide an undisturbed area for nonmotorized quiet water boating and wildlife observation. The implications of this designation have yet to be seen because last year there was no water in this portion of the reservoir all season.

V. RECREATIONAL CARRYING CAPACITY LITERATURE REVIEWED

A. Recreational Carrying Capacity Theory

Definitions of Recreational Carrying Capacity

The concept of carrying capacity has been much debated and researched. Originally a wildlife population theory it has been applied to a variety of recreation settings, including wildernesss areas, rivers and reservoirs. (Boteler 1986; Graefe 1988; Hendee, Stankey and Lucas 1990; Lime 1976; Stankey 1973, 1980; and others)

Shelby and Heberlein (1986) describe four types of recreational carrying capacity: Ecological, Physical, Facility and Social Capacity. Ecological capacity is concerned with impacts to the components of the ecosystem affected by the use level. Effects on ground cover by trampling, air quality from campfires and wildlife displacement from visitor disturbance are examples of ecological capacity considerations. Physical capacity relates to actual space impacts of visitor use. Number of people per a spatial parameter is the usual context for this capacity. In the case of swimming one would refer to number of people that would actually fit into a roped swim area, based on a management standard, as the physical capacity of the swim area. Facility capacity is a similar concept but deals with capacities designed into improvements and facilities for visitor needs. Most campsites have been designed to accommodate a certain number of vehicles and people, for example. Exceeding the design criteria would exceed the capacity for the facility. Social capacity is a limit on use beyond which unacceptable impacts to human experiences and values occur. This capacity limit is subjective in nature and must be bounded by a management parameter or standard. Standards based on number or type of encounters between groups or individuals reflect concern for social capacity. Social capacity can also include a component of outside interest groups and how they view the impacts of the activity on the local environment. (Martin and Uysal, 1990) Managing any recreation site at its optimal carrying capacity for an extended period of time must include consideration of the host environment as essential to maintaining visitor levels.

The Shelby and Heberlein also propose three rules for establishing social carrying capacity. They state that there must be a known relationship between amount of use and the social impacts with which management is concerned, that there must be agreement among affected groups on the type of recreation opportunity provided, and that these same groups must agree on the acceptable level of social impacts. Managements' task in setting a capacity limit is to negotiate expectations between users of the resource on the management objective and the recreation experience planned for the area. Establishing evaluative standards to measure the social impact is one way to develop consensus between users groups. (Whittaker and Shelby, 1988). Techniques like "Limits of Acceptable Change" (Stankey, et al., 1985) and the Carrying Capacity Assessment Process (C-CAP) (Shelby and Heberlein, 1986) rely on establishing management parameters after substantial public involvement.

In summation, recreational carrying capacity is a level of use beyond which impacts exceed predetermined evaluative standards. It considers both the physical world and the social interactions of people. Recreational carrying capacity depends heavily on management setting objectives for desired recreation experience outcomes. As such there is no one recreational carrying capacity, there will be a range of capacities depending on the corresponding management objectives of the area (Graefe 1988).

Crowding as a measure of Recreational Carrying Capacity

Crowding is an evaluative statement about the number of people within a given area. It should not be confused with density, which is a physical capacity of a certain number of people per unit area. Perceived crowding can sometimes be used as an evaluative standard for carrying capacity. Based on a review of twenty recreation studies Shelby and Heberlein (1986) (also Shelby, Vaske and Heberlein 1989) found that in general if over two thirds of visitors perceived a crowded experience then the social carrying capacity

has probably been exceeded. Conversely if less than one third of the visitors experience crowding use levels are likely within carrying capacity. When visitor experiences of crowding are between these two levels no clear value judgement can be made on carrying capacity; further study and collection of more information may be warranted. A study at Whiskeytown Reservoir in California used this approach to identify portions of the lake where carrying capacity was potentially exceeded (Lee et al. 1988). This method has been applied in other situations in Wisconsin and Pennsylvania as well (Drogin, et al. 1990, Graefe 1989, and Penaloza 1990).

During 1992 the Ogden District contracted with the Southeast Experiment Station to have the "CUSTOMER" survey administered at Pineview Reservoir. The formal results of this survey are not complete, however, one special emphasis question has been tabulated. Boaters were asked their opinion of the new carrying capacity restrictions. The exact question asked was:

> 3. The Forest Service has recently defined a maximum number of boats on the Reservoir at any one time. Which statement below best reflects your personal view about the number of boats allowed on the Reservoir. [CHOOSE ONE]
>
> A) The number of boats is not set high enough.
> B) The number of boats is set about right.
> C) The number of boats is set too high.
> D) There should not ever be a set number of boats on the Reservoir.
> E) Don't Know/No Opinion
> F) Other (please specify) _____.

The results of this question are shown below in Table 7. Nonrespondents were removed from the sample. The majority of responses are clustered around the new capacity being "about right" or "too high". Of those that had an opinion of the carrying capacity limits, a solid 43 percent responded that the limits needed to be set lower. While this question was not designed to address crowding on the reservoir, it can be assumed that a large group of boaters still feel crowded on Pineview Reservoir. Several other questions in the survey specifically address perceived crowding. Analysis of this data should help managers better understand how Pineview users perceive crowding on the reservoir. Final results of the "CUSTOMER" survey are to be released in June 1993.

Number of encounters or use levels are only a partial predictor of crowding. Because crowding is a subjective determination it is determined by the values and expectations of the visitor. Managers may be able to modify perceptions of crowding by bringing expectations of the recreation experience into line with reality. Advance notice of conditions may help visitors adjust their expectations which will change the way they evaluate their experience.

Table 7. "CUSTOMER" Survey Special Emphasis Question (% of Responses by Activity Type

	Angling/ Quiet Water	Boating/ Waterskiing	Camping	Day Use	Personal Watercraft
Number not high enough	1.9	5.8	0	0.8	1.0
Number is about right	35.3	34.0	35.9	37.8	52.0
Number is set too high	31.4	35.0	28.2	31.9	39.0
No number should be set	0	7.8	2.6	1.7	0
Don't Know/No Opinion	29.4	6.8	30.8	21.0	6.0
Other	0	9.7	2.6	6.7	2.0

Note: 412 Useable Responses

Rationing Recreation Use

Rationing use is often the end result of recreational carrying capacity studies. Four different criteria have been identified for consideration when rationing use: Equality, Equity, Need and Social Efficiency. Equality refers to everyone having equal opportunity to share in the benefit of the recreation use. All people are treated the same way with this criteria. Equity implies fairness. Generally in this context those who put more effort into the system receive a larger portion of the use. Need as a criteria is seldom applied because by nature need is difficult to define. It is a subjective determination of who should have more use based on the perception that they need more than others. Social Efficiency is the concept that whoever values the use the most will be willing to pay the most for it in time or money or effort and thereby should be allocated more of the use. In practice Equality is the easiest to apply. Most rationing schemes actually incorporate components of all these criteria.

In the case of Pineview Reservoir current management direction is to treat everyone equally with the exception of Yacht Club members. In an effort to be "fair" they receive a portion of the boating allocation because of the past effort they have put into reservoir management and in recognition of their expenditures for their facility. Because fees are low and the reservoir has been accessible to all groups social efficiency criteria have not been applied.

Allocating Recreation Use

Once a decision to ration use has been made the manager must then decide on an allocation strategy. The most common way to allocate things is by price. However in recreation use situations price has not been much used because of its inherent lack of fairness to people without money. Many managers rely on queueing systems, often called "first come, first served" methods. This system favors those with time but is considered more fair than pricing methods. Similar in concept, requiring reservations as an allocation method is widely used. This method puts a premium on planning ahead. Generally the allocation is based on the first one to ask for a reservation receives it. When all people requesting a portion of the allocation

compete for the use, some sort of lottery mechanism is implied. The lottery may treat everyone who applies equally or may provide different sets of odds to specific groups in order to meet equity or "fairness" objectives. Giving people who have applied but not drawn river permits in years past a greater chance of being selected for a current year permit is an example of how lotteries may be manipulated. Another method of allocating use is through merit. In this system some testing mechanism is applied to those requesting the use in which they demonstrate their competence against some set criteria for the allocation of the use. This method is not frequently used though it has been applied as a screening mechanism for the distribution of hunting and driving licenses. (Shelby and Heberlein, 1986; Wikle 1991)

Managers may also affect use allocations by redistributing use through scheduling. By placing limits on certain days or hours or types of use managers can cause displacement of visitors to less crowded times and locations. When an area is heavily impacted only on weekends, use limits may cause weekday use to increase as people migrate to those times they can access to the resource without restrictions. (Shelby and Johnson, 1988)

There are many other possible ways to allocate use. Wallace (1983) compared 21 different strategies for feasibility in river management. See also Cordell (1981), McCool and Utter (1981), Shelby (1981), and Stankey and Baden (1977). Managers tend to pick a system they think is easy to implement and fair (Wikle 1991).

Boating visitors to Pineview Reservoir are currently allocated use on a "first come, first served" basis. The new capacity regulations have not been tested yet because of last years low water. This summer the District anticipates the limits will be reached. A process for implementing this queue system is discussed later in this report. Future monitoring and review of the process may indicate a need for looking at other systems such as reservations. Many reservoirs in more populated areas have resorted to reservations in order to help visitors schedule their activities when there is a large demand for a scarce resource.

B. Boating Capacity Standards

Several process techniques have been created to guide managers in determining boating carrying capacities. These techniques share common steps of gathering information on physical and social impacts, prescribing a desired experience, establishing standards, implementing and monitoring the standards. Besides the LAC and CA-AP processes mentioned earlier, Visitor Impact Management (Graefe et al. 1986), the Recreation Carrying Capacity Handbook (Urban Research and Development Corporation 1980) and Assessing Carrying Capacity (EDAW 1981) all provide techniques for measuring and implementing recreation carrying capacity. Given the time constraints of this study, however, a capacity will not be determined from scratch but rather by reference to other studies.

Recreational carrying capacity standards are guidelines for the desired level of use in a specific area as a result of setting management objectives for impacts both social and physical. They represent a prescribed amount and type of use allowed. They may find their origin calculated from pure physical design constraints or from specifications to ensure the meeting of management objectives for number and type of encounters.

There is no one set recreational carrying capacity standard which may be applied in all cases. By its nature carrying capacity is a reflection of the desired conditions or management objectives of the area managers. In reaction to an observed set of impacts to the physical and social environments, management may develop a carrying capacity limit as a way to cope with these impacts. Managers may then monitor the effectiveness of the limits through the application of evaluative standards which specify desired outcomes for impact levels.

Boating carrying capacity standards are a summary measure of these set of desired future conditions. They are an index reflected in one prescribed number, usually denoted in terms of acres per boat. Once useable acres in a body of water are identified the manager can apply the desired capacity standard to determine the instant capacity for the allowed use.

Table 8 below reflects a summary of various boating capacity standards which have been established in North America. Note the wide variance of standards. One should be careful not to apply a given standard without understanding the characteristics of the area where the standard is applied, the management objectives of the area and nature of type and amount of use found in the area. Local knowledge of boating patterns, types of users, timing of use, access points and other site-specific characteristics is essential in order to construct a boating capacity that will meet desired management objectives. Boating carrying capacity standards are a subjective judgement by the area managers. The standards cited in Table 8 all incorporate physical capacity, usually measured as density or acres of water surface area per boat, to estimate recreational carrying capacity.

While it is hazardous to generalize about these standards there do appear to be some trends for certain types of boating uses. Water skiing, which by nature requires the most water surface area, has standards from 20 to 40 acres per boat. Typical ranges for power boating are from 10 to 20 acres per boat, while flatwater boating may vary between 5 and 10 acres per vessel depending on the experience provided. Other water uses for sailing, human powered and fishing usually range from under an acre per boat to 5 acres per boat.

No specific standards could be found for personal watercraft. These relatively new craft are lightweight, highly maneuverable, and fast. Carrying from one to four people these craft probably impact as much or more surface area space as a power boat.

Recreational Carrying Capacity Monitoring

Measuring use is essential when carrying capacities are established. Many areas restrict boating access through the provision of limited parking areas and access points to water. Others simply count boats on and off the water. In order to monitor the effectiveness of a capacity some measurements are necessary.

Several methodologies have been developed for estimating boating use. Most rely of visual sightings either from ground observers or by aerial photogrammetry. The cost varies dramatically depending on the intensity of the survey and the number of people involved. Generally aerial techniques are less costly if trained interpreters are available to analyze photos. (Jaackson 1989; Deuell and Lillesand 1982; James et al. 1971)

The same techniques can be applied to determining the spatial patterns of boating. This can be useful in noting key areas of congestion, limited access and other determinants of crowding. The effect of regulating types of use can be monitored with these procedures.

Table 8. Sampling of Boating Standards by Type of Activity

Source [1]	Power Boating	Flatwater Boating	Water Skiing	Human Powered	Sail Boating	Boat Fishing
1. Cited in Lake Minnetonka Plan						
Army Corps of Engineers	1					
California	1					
Minnesota DNR	10					
Ontario	10					
Wisconsin DNR	20					
Manitoba	50					
Soil Conservation Service	-	3	5	-	3	.2
Bureau of Outdoor Rec	-	-	20-40	-	-	4-8
Ohio	-	5.5	5.5	5.5	5.5	5.5
Park Planning Guidelines	-	1	-	-	.4	.2
Pennsylvania	-	3	-	-	2.6	5
2. Cited in Arizona Outdoor Rec Commission						
Threinen (1964)	10	-	20			
Petersen (1968) Summary	12.2	5	29.2			
Indiana DNR	10	2.25	18			
Kansas Parks Authority	3	2-7	10			
Louisiana Parks Com	20	8	40			
Michigan Dept of Con.						
low intensity of use	10	1	20			
med intensity of use	20	5	40			
high intensity of use	40	10	60			
Ohio DNR	3	3	6			
Texas Parks Dept.	2.8	-	-			
Wisconsin Con. Dept.	20	8	40			
Lake Mead	20	10				
Jaakson	-	-	-	-	3	1.25
3. Cited by Urban Research and Development						
Low desired density	18	10	20	2.5	-	1
Optimum Capacity	9	4.3	12	1.3	-	.5
High desired density	3	2	7	.5	-	.06
4. Ohio Department of Natural Resources	7.5	5				
5. Ontario - Water Oriented Recreation Carrying Capacity Standards	17.3	-	37.1	.5-1.2	1.2-2.5	.25

[1] Sources for Table 8.

1. Lake Minnetonka Plan, page 23, Xerox copy. Modified from Minnesota Department of Natural Resources, 1987: Lake Development.

2. State Improvement Lake Fund: Assessing Carrying Capacity. Arizona Outdoor Recreation Coordinating Commission, 1981.

3. Guidelines for Understanding and Determining Optimum Recreation Carrying Capacity, Urban Research Development Corporation, 1977.

4. Lake Capacity Analysis, Ohio Department of Natural Resources, Planning Manual. 1987?.

5. Water Oriented Recreation Carrying Capacity Standards, pg 15-25. Xerox copy. Upper Clutha Hydro-lakes Plan, Ontario.

VI. RESERVOIR CAPACITY DETERMINATION METHODOLOGY

A. Previous Capacity Determinations

The first recorded attempt at devising a carrying capacity at Pineview Reservoir occurred in 1976 with the Pineview Reservoir Recreation Composite Plan. After a review of standards in existence at that time the planners used a 5 acres per boat figure with a total allowance for 466 boats at one time. This study also calculated the potential launch capability at each boat ramp. This portion of the plan indicated that launch potential was in excess of the set capacity by nearly 100 boats. It is unclear from the record whether this limit was ever enforced.

The second effort at setting a capacity took place during development of the Wasatch-Cache Forest Plan in 1985. After a cursory review of use data a decision was made to round the capacity downward to 460 boats. Again no record of enforcement is available.

The third effort began in 1991 as the Ogden Ranger District began to review current boating policies on Pineview Reservoir. Reservoir managers felt the allowed numbers in the existing carrying capacity policy were too high in order to effectively increase public safety, decrease boating congestion and improve visitor satisfaction. After a period of analysis the District proposed a dramatic reduction in the number of boats on the the reservoir and zoning which would have affected some types of uses. The public was invited to discuss the proposed action. The public clearly told us that other options should be considered first before reducing numbers. Due to a lack of detailed use data no decision was made and instead user numbers were monitored during the summer of 1991.

As the 1992 boating season approached it was apparent that drought conditions would leave Pineview Reservoir water levels well below normal. Reservoir managers were concerned that visitor levels would be too high with the lower water. Armed with the collected visitor data, rough calculations of surface area and professional judgement on acceptable levels of boating congestion a new analysis of boating capacity was made and documented in the Pineview Reservoir Environmental Analysis. The decision to implement was approved by the Forest Supervisor, Susan Giannettino.

This effort set out to establish new boating zones, set a revised total capacity limit and set reduced limits as water levels dropped. The special management zones were identified, mapped, and planimetered to determine acreage within each zone. Useable acres were then calculated by subtracting all zones acres from the remainder of the reservoir acreage. An assumption was made that the first 10' of the reservoir was not useable because of proximity to shorelines and shallow depths (Jaackson 1971). Therefore the 4890' elevation was the source for surface acres. After identifying the acreages within each zone and establishing useable acres a professional estimate was made concerning a target for boat capacity. Four alternatives ranging from 300 to 460 total boats were analyzed. An acreage/boat figure was then calculated for each alternative and compared to the existing situation. Capacity reductions for lower water levels were arbitrarily set at 50 boats for each 10' drop in elevation starting with the 4880' elevation. The effect on boaters was then determined through comparisons of boating use from the previous year with the number of boats expected on any given day. Estimates of the number of boaters having to wait before launching were made this way for the alternatives reviewed.

After the analysis a revised capacity level alternative was picked that modified the boating capacity from a ratio of 5 acres/boat to 6 acres/boat. This reduction was coupled with enlargement of wakeless speed zones in areas of congestion. At the time managers felt that zoning alone would reduce congestion at key congregating points like Bluffs swim area. Therefore major reductions in total boating numbers were not proposed because of concern over implementing restrictive boating limits. At this time no other lake in Utah has an enforced boating capacity (Wooley 1993).

The revised capacity levels were implemented July 7, 1992. They were never exceeded during the remainder of the season because of lower than normal use due to low water levels. Monitoring during the 1992 boating season however indicated a need for a greater reduction in boats during peak use periods

on weekends, especially at the lower water levels. It was visually apparent that the useable acres as the water elevation changed had a greater variance than was assumed because of islands and sand bars limiting portions of the boatable surface area of the reservoir. Congestion of boats was still a perceived problem. The partial evidence from the CUSTOMER survey results, discussions with boaters and review of the literature all indicate that the total boat numbers may still be too high for the given useable acres.

B. Reservoir Capacity Calculation Procedure

Estimating Physical Capacities

The current study used a similar methodology to the effort of 1991 but with a different set of techniques and with more precision. A depth map of Pineview Reservoir, with a 5' contour interval, was digitized and manipulated within a Geographic Information System (GIS) using Arc/Info (v. 6) software. Coverages were created for the elevations of the reservoir (Figures 2 and 3) and for the various zones that had been designated (Figure 4). The two coverages were then overlayed and their attributes unioned to create a composite cover with individual polygons for each elevation and zone (Figure 5). For display purposes a three dimensional reservoir map was also created (Figure 6).

Area calculations for each polygon were determined using the database function of the software. The area information was converted to reflect the number of boats allowed within the polygon for a range of acres per boat standards. The boat standards calculated ranged from .5 acres per boat to 40 acres per boat. This information was transferred to a CEO Spreadsheet where a number of different scenario alternatives were established to determine a boating carrying capacity given a specific boating standard for the two main zones (Motorized and Wakeless) on the reservoir. Because the Nonmotorized zone users are expected to be different from boaters on the rest of the reservoir the capacity figures calculated for this zone will not be added to the total for the reservoir.

Limitations of the Method

This method gave more precise information on the acreage in each zone and within the reservoir. Accuracy of the acreage however hinged upon the base map used for the digitization. After the map was digitized the area calculations were compared with U.S.G.S. published information on surface area for each elevation. Differences were minor for most elevations except for the starting elevations. It was determined that the placement of the digitized high water line elevation accounted for this variance. Because the high water level is not used in most capacity calculations this area was adjusted by a factor to reflect the published acres. Other variances were within +/- 18 acres for each level of the reservoir. The effect on boating capacity of this deviation would be within +/- 2 boats at most standards or less than 1% error. This was deemed an acceptable level of deviation. Given more time the digitized map could have been edited to more closely approximate the given surface area at each elevation. Acreage tables are included in Appendix A.

FIGURE 2

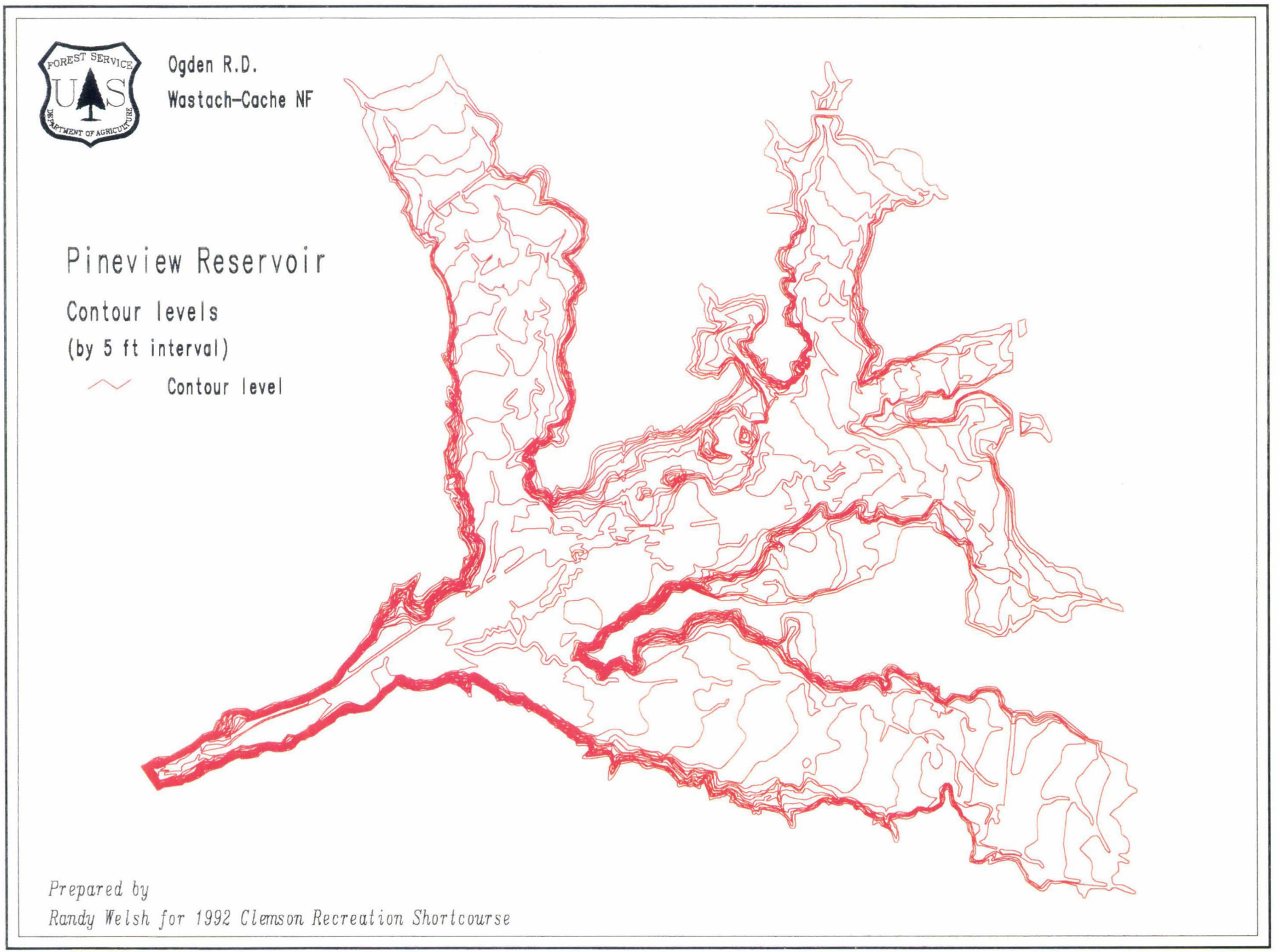

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
Contour levels
(by 5 ft interval)
Contour level
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

FIGURE 3

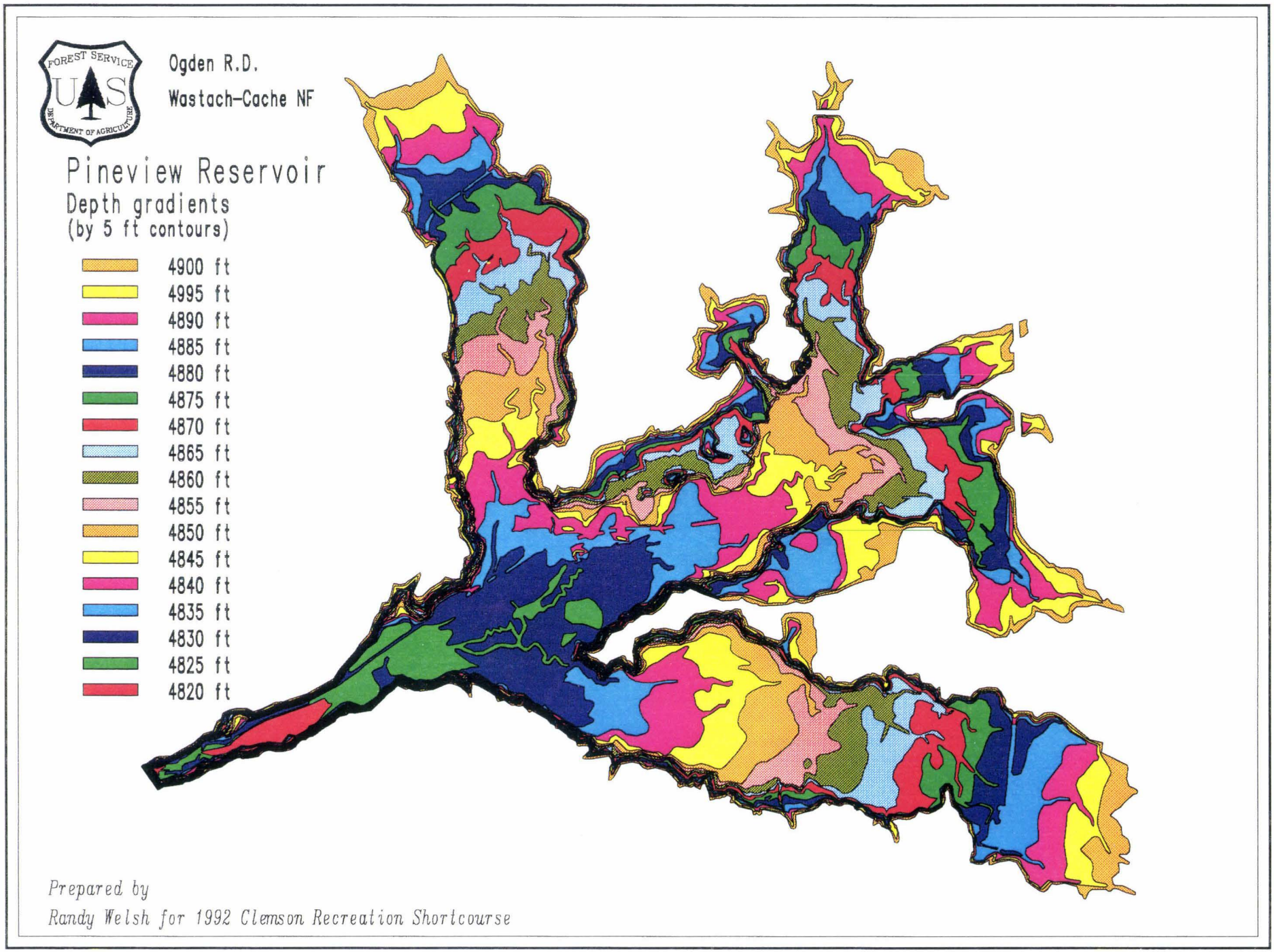

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
Depth gradients
(by 5 ft contours)
4900 ft
4995 ft
4890 ft
4885 ft
4880 ft
4875 ft
4870 ft
4865 ft
4860 ft
4855 ft
4850 ft
4845 ft
4840 ft
4835 ft
4830 ft
4825 ft
4820 ft
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

FIGURE 4

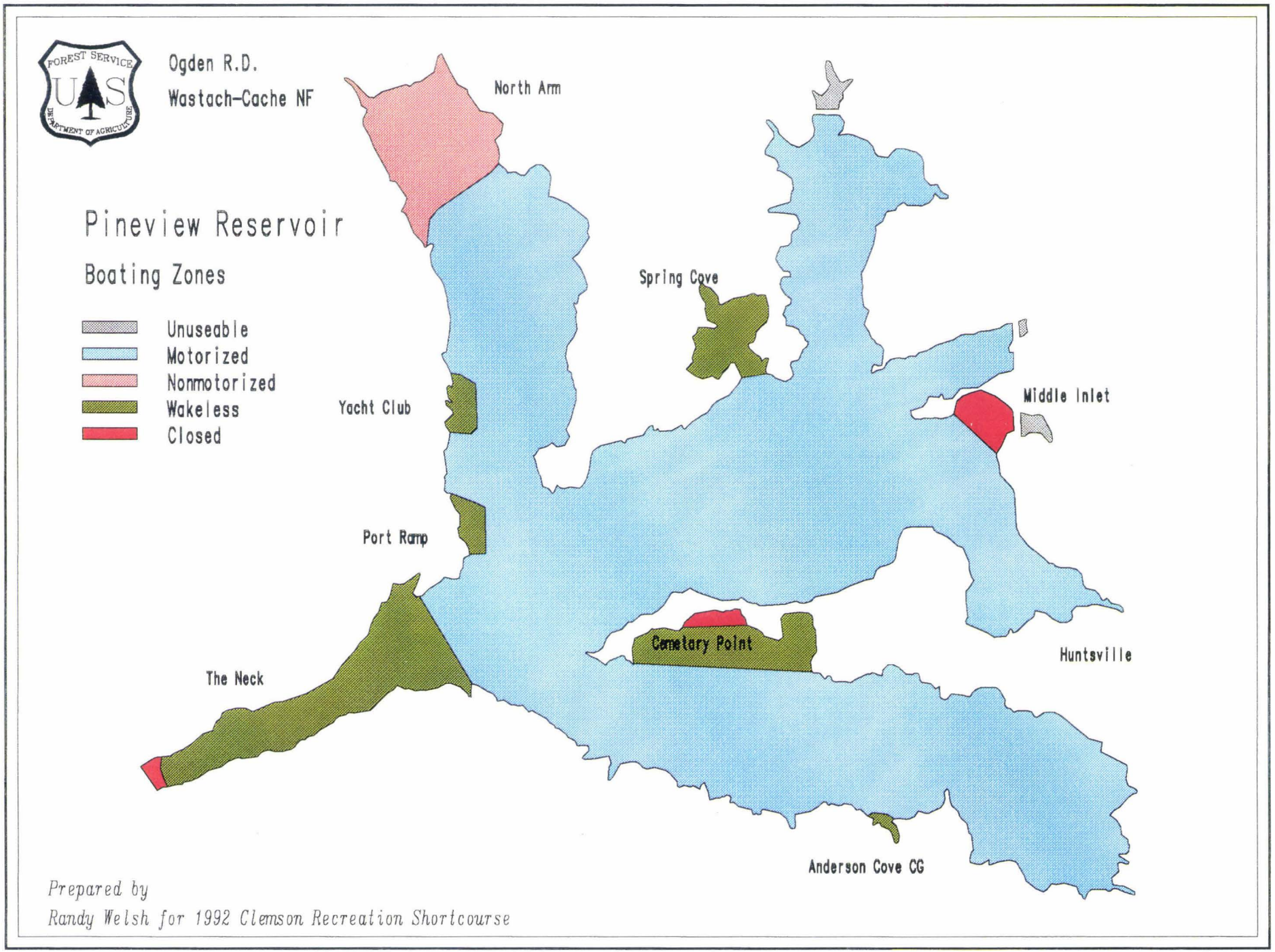

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
Boating Zones
Unuseable
Motorized
Nonmotorized
Wakeless
Closed
North Arm
Spring Cove
Middle Inlet
Yacht Club
Port Ramp
Cemetary Point
Huntsville
The Neck
Anderson Cove CG
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

FIGURE 5

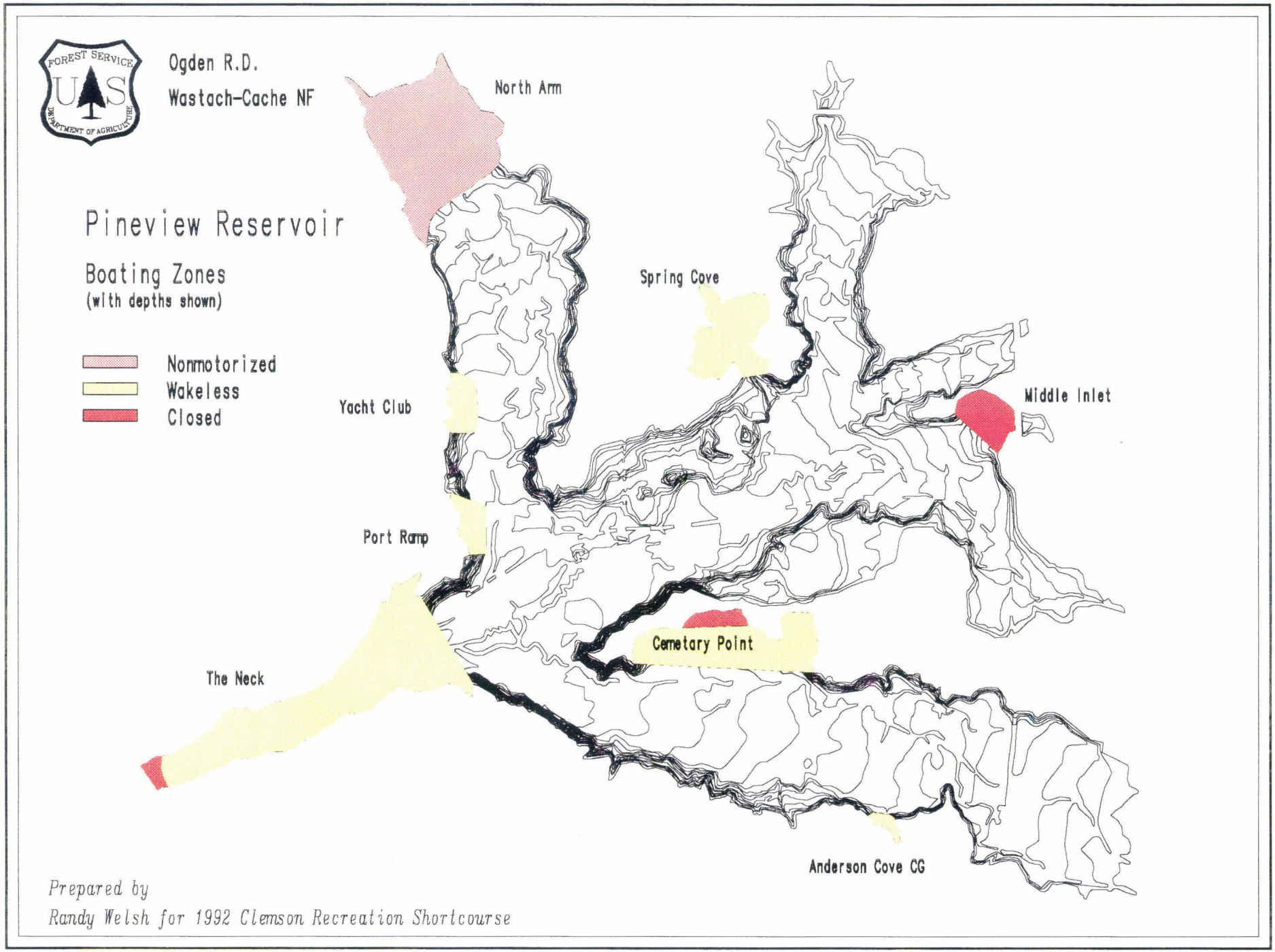
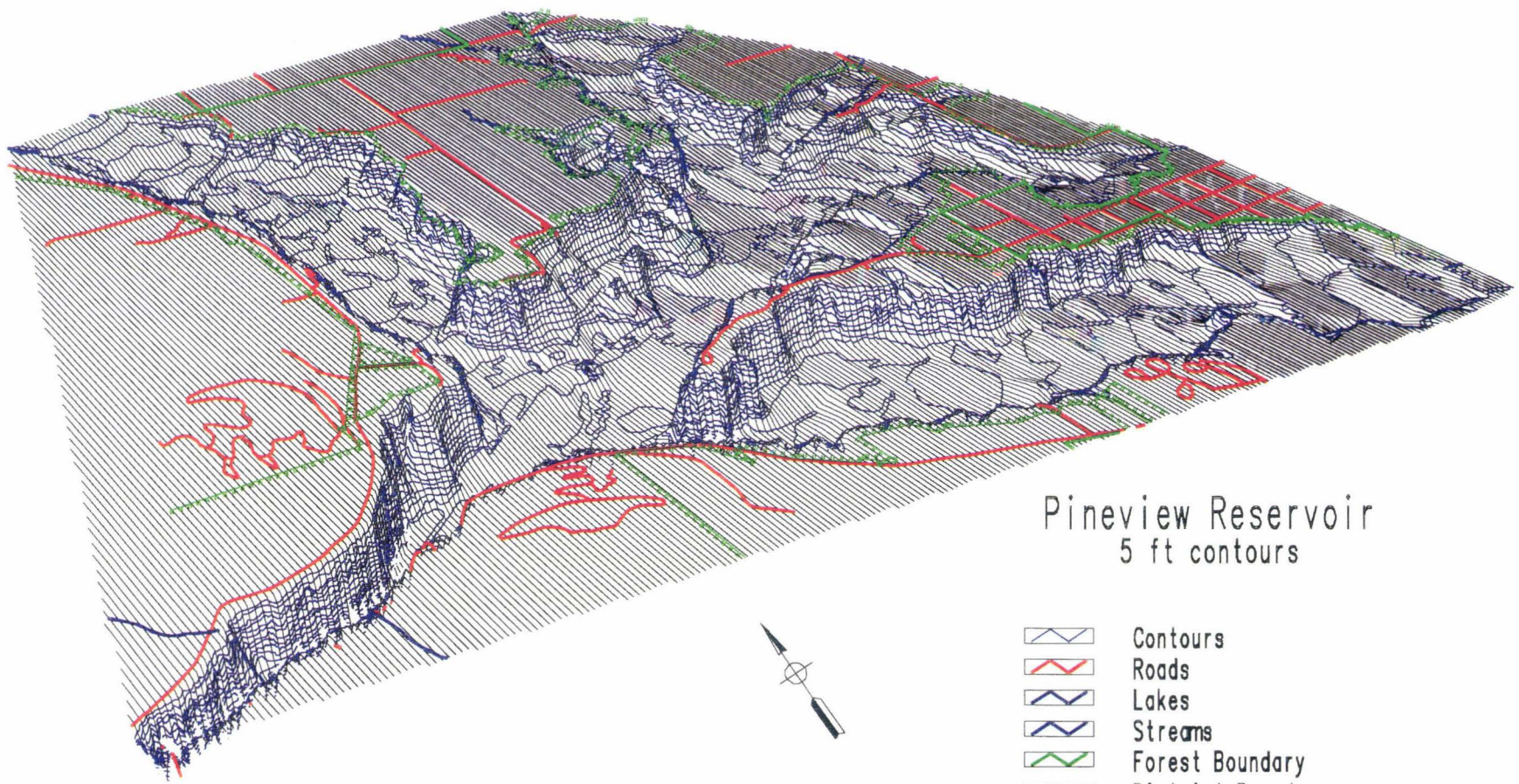

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
Boating Zones
(with depths shown)
Nonmotorized
Wakeless
Closed
North Arm
Spring Cove
Yacht Club
Middle Inlet
Port Ramp
Cemetary Point
The Neck
Anderson Cove CG
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

FIGURE 6

Ogden R.D.
Wastach-Cache NF



Pineview Reservoir
5 ft contours

- Contours
- Roads
- Lakes
- Streams
- Forest Boundary
- District Boundry

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Randy Welsh for 1992 Clemson Recreation Shortcourse

VII. ANALYSIS OF RESULTS

A. Alternatives Analyzed

Four alternatives were developed to address the effects of applying different boating standards to Pineview Reservoir. One alternative closely approximates the current boating policy. Two alternatives apply an average boating standard for power boating and water skiing, respectively. The final alternative examines the effect of a highly restrictive management policy on the reservoir. Detailed tables with assumptions and results of each alternative can be found in Appendix A. Summary information is provided in the descriptions that follow.

While it is possible to make many different alternatives combination of zone and standard these four alternatives have been chosen as representative. Because capacity in this case is a linear relationship between acres and the standard applied the alternatives act similar to benchmarks. Further analysis could be applied to fine tune the capacity if more precision was desired.

Assumptions common to all Alternatives

For each alternative acreages in the "Closed", "Unuseable", and "Nonmotorized" zones have been excluded from the calculations. "Closed" and "Unuseable" zones are never available for boating. Swim areas and the spillway of the dam are the "Closed" zones. "Unuseable" zones are not accessible to boats but are considered within the pool area of the reservoir. The "Nonmotorized" zone is technically open to boats with electric motors. In practice this new area will attract a new clientele different from the power boaters on the reservoir. It is not included in any of the calculations because the number of boats entering from other "Motorized" portions of the reservoir should be few. This assumption is subject to monitoring and change in the future.

Jaackson (1971) suggests that a shoreline zone should modify capacity calculations. This zone reflects a reduction in capacity because of shallow water near shore, conflicts with docks and piers, disturbance to banks and shorelines and other impacts near land. He suggests the larger of a 300' belt or out to the 5' contour level be set aside with a lower speed and a smaller standard. While one can then expect a higher number of vessels per acre the nature of the use is quite constrained to movement to and from shore and wakeless speeds. When the body of water has many bays and convolutions this can dramatically reduce the area available for higher speed boating. This effect has been mimicked in all alternatives by assuming that the first ten feet of water is unuseable. Pineview Reservoir shoreline is highly convoluted and the banks are generally steep. The bottom is relatively flat on the old valley floor and during drawdown there are many shallows and islands that constrain boating. This adjustment approximates the lack of usefulness for boating that this portion of the reservoir has at different water levels. Analysis of the effect of this constraint reveals that the average reduction in capacity with a standard of 7.5 acres per boat is between 24 and 27 boats or only 6% of total current capacity. At a standard of 15 acres per boat this constraint is lowered to 14 to 17 boats on average or only 4% ot the total. The difference between the two standards is 10 boats or 2% of the total. With more restrictive standards the capacity lost in this zone would continue to decrease. Figures 7 and 8 display this feature at two different water levels with a 5' constraint for illustration purposes.

Boating in the designated "Wakeless" zones is characterized by slow speeds, travel to and from shore, and access of docking and launch facilities. In most cases at the Bluffs wakeless zone, boats are beached on shore. The wakeless zone in the Neck receives the most visits as boaters take a break from the action of the motorized zone. To gauge the most appropriate standard to apply in this zone a sensitivity analysis was performed. Standards were set at 2.5, 5 and 7.5 acres per boat. At the midpoint, 64.3 boats could be accommodated in the wakeless zone during highwater. The number of boats doubles to 129 vessels at the lower standard and decreases only by 21 boats at the higher standard. At the 2.5 standard this approximates only 15% of total use. While this may be significant, especially on weekends, congestion in the wakeless zones would increase because boaters do not space themselves evenly throughout the zone. Instead they tend to congregate at the facilities or on the shoreline. For each alternative the midpoint standard will be used to standardize the contribution of the "Wakeless" zone to total boating capacity. More

study of boating patterns in this zone is needed before a standard can be applied with complete confidence.

Alternatives Considered

Alternative No. 1 - Current Policy with New Acres

The estimated boating standard that was determined with the 1991 study was 6 acres per boat. Through trial and error using the digitized data the current policy of 430 boats closely approximates a standard of 7 acres per boat. This difference is probably due to slight adjustments in the location of zone boundaries and in acreage estimation. Because not all boats will be on the reservoir at one time, a standard of 7.5 acres per boat to the "Motorized" zone will be used in order maintain a progression in the data with the other alternatives. This alternative is used as a reference to compare the newly calculated acres with the assumptions of the earlier analysis.

Alternative No. 2 - Power Boating Alternative

This alternative applies a standard of 15 acres per boat to the "Motorized" zone. This is approximately the average standard for powered boating in the literature reviewed.

Alternative No. 3 - Waterskiing Alternative

Waterskiing on the reservoir is a significant portion of boating activity on Pineview. Maintaining distance between boats is critical to skier safety. This alternative indicates the impact of setting a standard of 30 acres per boat. Again this is roughly the average standard for waterskiing in the literature. In practice one could consider proportioning this standard with power boating to reflect a mixed use on the reservoir. By its nature however, waterskiing tends to dominate major sections of the reservoir because of the many turns, take-offs and spills of the skiier. Other boats tend to give wide berth to skiiers. The implications of the higher standard will be addressed by this alternative.

Alternative No. 4 - Highly Restrictive Management

This alternative examines the effect of applying a highly restrictive standard of 40 acres per boat. This objective would be accompanied by a low level of use. This standard is at the outer extreme of capacity standards.

FIGURE 8

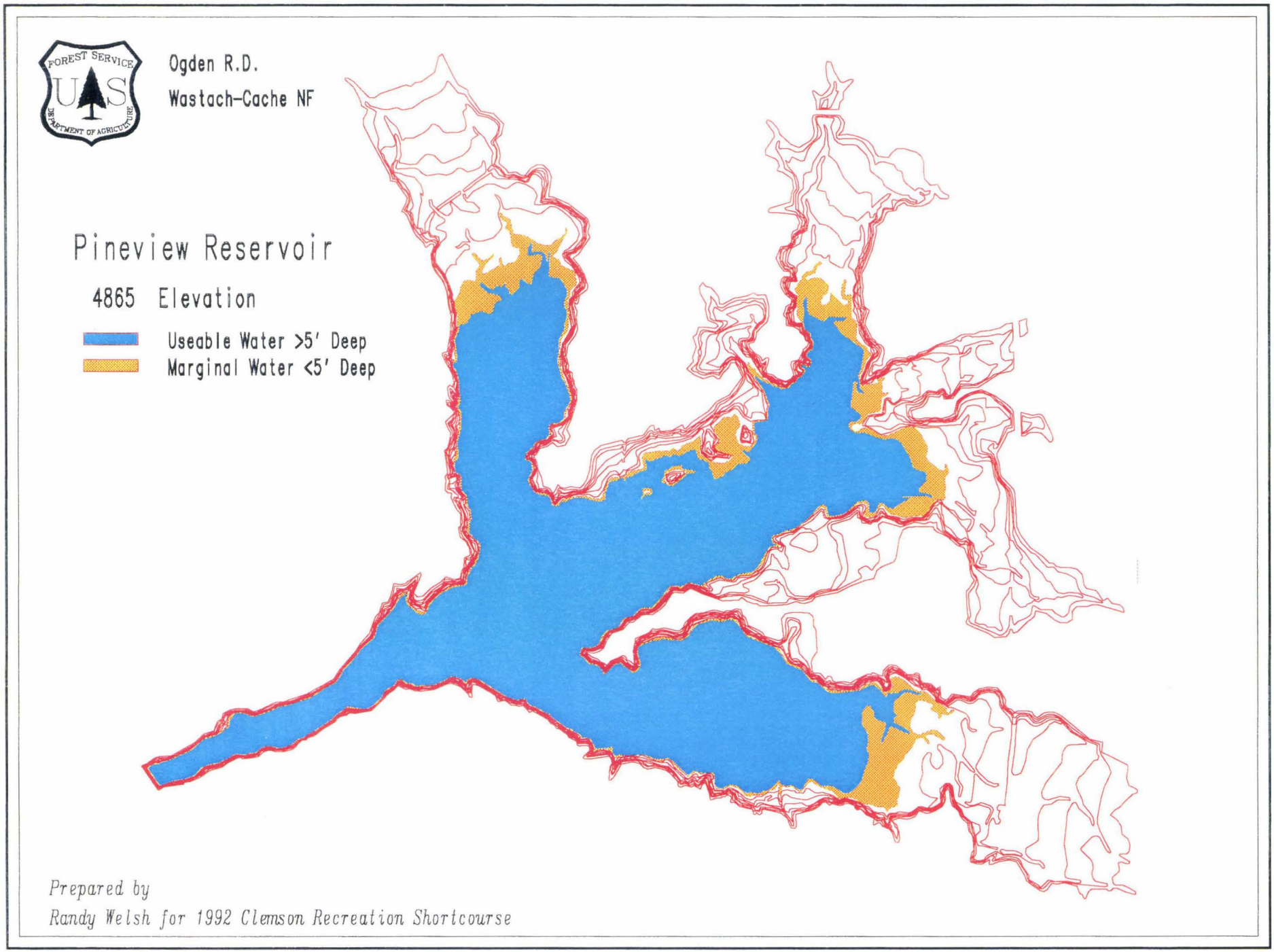
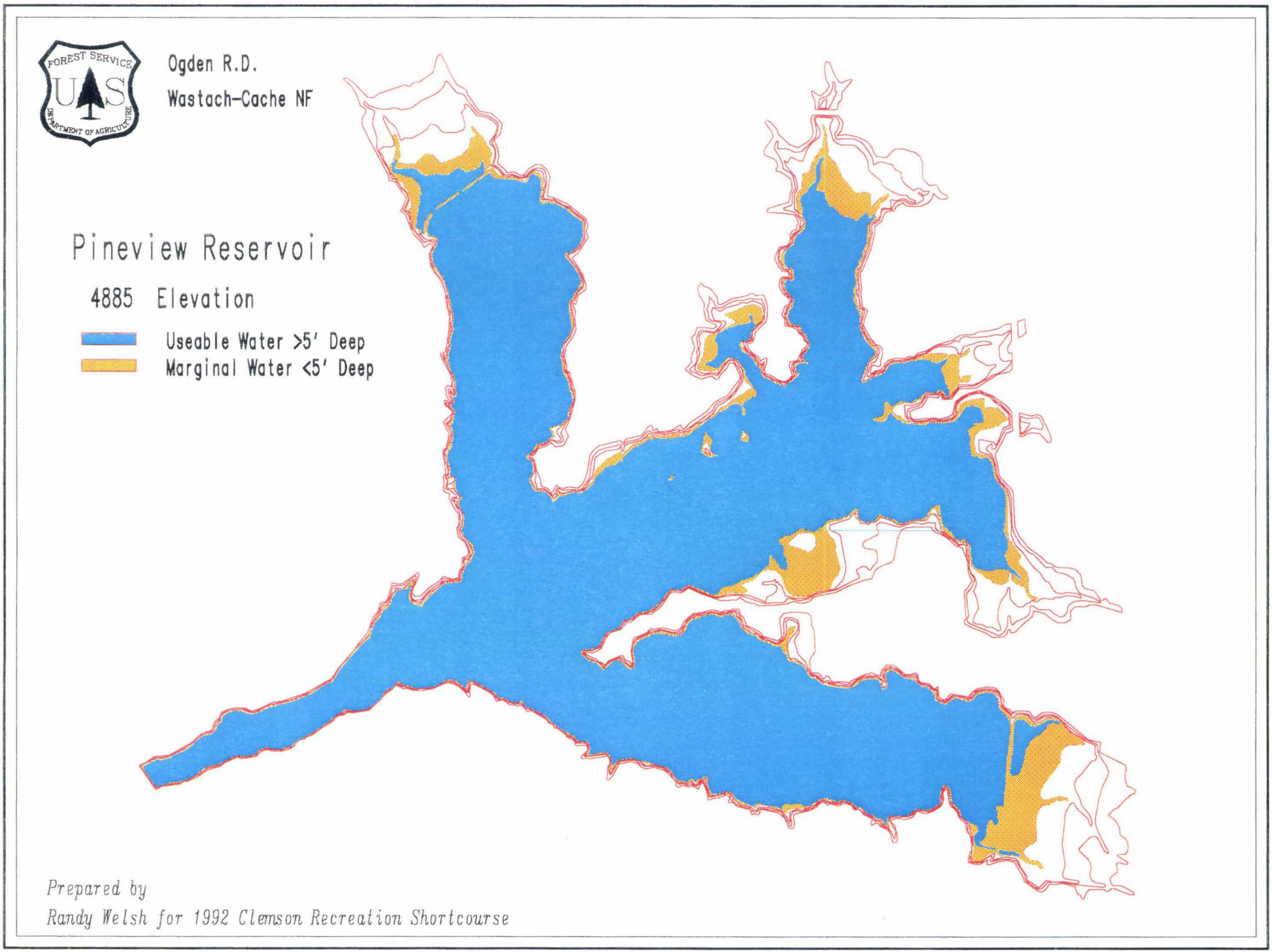

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
4865 Elevation
Useable Water >5' Deep
Marginal Water <5' Deep
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

FIGURE 7


FOREST SERVICE
USDA
DEPARTMENT OF AGRICULTURE
Ogden R.D.
Wastach-Cache NF
Pineview Reservoir
4885 Elevation
Useable Water >5' Deep
Marginal Water <5' Deep
Prepared by
Randy Welsh for 1992 Clemson Recreation Shortcourse

B. Effects of the Alternatives

Each alternative will be compared with the existing carrying capacity by elevation to measure the effect of applying a different standard. Tables 9, 10, 11, and 12 display this information for each alternative. Estimates are shown on the number of people potentially impacted during average weekends and for peak use days. This impact was measured by comparing proposed number of boats with visitor patterns from the 1991 boating season. During 1991 average weekend use was 390 vessels and the peak day was 560 boats. Average number of people per vessel is estimated at four (4). The impact estimates at low water only reflect differences from highwater use figures. In reality the actual impacts at low water would be smaller because people would change their behavior towards boating with changes in capacity and water level (Shelby, etal., 1989). Some would be displaced to other reservoirs, others would decide not to boat at low water, and some would choose to boat during non-peak hours. Overall impacts on visitor use would probably drop over time as people are displaced to other areas, change their boating pattern, become accustomed to the lower capacity or shift to other types of recreation. Implications of each standard are discussed in this section.

Alternative No. 1 - Current Policy with New Acres

At high water this alternative is similar to the existing condition. Several times during the season potential demand would exceed the capacity limit. The actual effect of limiting access to the reservoir during peak times is still to be evaluated. The effect of not establishing a shoreline zone concept with the existing policy is reflected in that the number of boats drops from 396 to 291 with the first 20 ft drop in water as compared to only 55 with the existing capacity. This means that the existing policy artificially raises the level of boats on the main body of the reservoir. By reflecting the shoreline zone and the same standard about 50 fewer boats would be on the water.

The assumption of the existing policy that boat numbers should drop by 50 as the water level drops 10 feet is validated by this analysis. This relationship is apparent when the same standard is applied to the newly calculated acres in the GIS database.

Table 9. Alternative No. 1 Comparison with Existing Capacity

Elevation	Existing	Proposed	No. of Boats Difference	Weekend Impact [1]	Peak Impact
4900	430	396	-34	0	1-656
4880	375	291	-84	1-396	1-1076
4870	320	241	-79	1-596	1-1276
4860	265	190	-75	1-800	1-1480
4850	215	140	-75	1-1000	1-1680

[1] Number of people potentially affected

Alternative No. 2 - Power Boating Alternative

Boating numbers dropped dramatically with this alternative. Over half of the existing capacity would be lost by applying this standard. This capacity level is similar to amounts of use on most weekdays during the peak season and some shoulder season weekends. A substantial number of people would not be able to boat on Pineview during weekends and occasionally on weekdays. While those on the reservoir no doubt would increase feelings of satisfaction because of lower numbers and improved safety there would be a highly dissatisfied group of people who were denied access to the reservoir. Implementation of this

alternative would require much public involvement and understanding by users that this restriction was necessary (Frost and McCool 1988).

Table 10. Alternative No. 2 Comparison with Existing Capacity

Elevation	Existing	Proposed	No. of Boats Difference	Weekend Impact [1]	Peak Impact
4900	430	199	-231	1-764	1-1444
4880	375	169	-206	1-884	1-1564
4870	320	141	-179	1-996	1-1676
4860	265	114	-151	1-1104	1-1784
4850	215	87	-128	1-1212	1-1892

[1] Number of people potentially affected

This alternative would pose concern to concessionaires running the boat ramps. They would lose potential revenue frequently during their most busy days. This may hamper their ability to recoup costs for the whole season. The Forest Service could expect to get less maintenance work from permittees because of lower revenues unless fees were increased.

Alternative No. 3 - Waterskiing Alternative

This standard further reduces use levels by 40% over alternative #2. Given current use patterns every weekend throughout the season and most weekdays during the peak season would be affected by this lower standard. Setting a limit that favors one type of use over another is politically unfavorable. Power boaters and fisherman may feel that they were discriminated against because of the higher standard. They may not appreciate the improved safety and vastly reduced congestion if they are not able to use of the reservoir.

Table 11. Alternative No. 3 Comparison with Existing Capacity

Elevation	Existing	Proposed	No. of Boats Difference	Weekend Impact [1]	Peak Impact
4900	430	126	-304	1-1056	1-1736
4880	375	108	-267	1-1128	1-1808
4870	320	91	-229	1-1196	1-1876
4860	265	76	-189	1-1256	1-1936
4850	215	60	-155	1-1320	1-2000

[1] Number of people potentially affected

Managers may consider this standard if a quality experience with few boating conflicts is desired. In practice it may be impractical because of the limited number of boats allowed on the reservoir. Over 70% of the current boats would be removed. This alternative would be hard to promote with the public and other local officials. It would cripple concession operations unless fees were raised substantially.

Alternative No. 4 - Highly Restrictive Management

Over three quarters of the boats would be removed at a standard of 40 acres per boat. This number of boats is equivalent to a normal weekday during the shoulder seasons. Past experience indicates that this would leave much of the reservoir underutilized. Access to the reservoir would be at a premium and law enforcement would undoubtedly increase as people looked for ways to sneak on the water.

Like alternative #3, this choice would adversely affect too many people. Without a major shift in visitor expectations and desires, managing for this small number of people is infeasible and an inefficient use of public funds.

Table 12. Alternative No. 4 Comparison with Existing Capacity

Elevation	Existing	Proposed	No. of Boats Difference	Weekend Impact [1]	Peak Impact
4900	430	108	-322	1-1128	1-1808
4880	375	92	-283	1-1192	1-1872
4870	320	79	-241	1-1244	1-1924
4860	265	66	-199	1-1296	1-1976
4850	215	54	-161	1-1344	1-2024

[1] Number of people potentially affected

C. Proposed Recreational Boating Capacity

Setting a carrying capacity requires having a desired goal in mind. Current management direction is still too unfocused as to the types and kinds of experiences provided at Pineview and the level of conflict and congestion that is acceptable to users and managers. More information is also needed on the types of impacts visitors perceive and an understanding of boating spatial patterns.

There is hope for the future that these shortcomings can be satisfied. The CUSTOMER survey information will provide valuable information on user satisfaction levels, perceptions about crowding and the importance of various activities and impacts. Analysis of this data will help reservoir managers better understand their visitors and their desires. Key to setting a capacity limit will be their response to crowding and safety issues (Drogin et al. 1990, Graefe 1989).

The Wasatch-Cache National Forest is embarking on revision of their Forest Plan. By carefully incorporating public involvement in the establishment of desired future conditions for Pineview Reservoir capacity expectations can be articulated, discussed, and settled. Managers are now prepared with the tools to display the effect of any combination of standards for the reservoir.

Finally, several use estimating techniques have been identified which, when applied, will provide essential information on boating patterns, key attractions and congestion points, and use types. By adding more detailed information on boating hours, length of stay, boat occupancy rates and total use, managers will be prepared to fully address boat capacity issues.

In the interim, the existing capacity should be modified to better reflect the shoreline zone concept. By keeping the same standard of 7.5 acres per boat and adjusting the useable acres as shown in Alternative #2, boat numbers would be reduced by nearly 100 as the water level drops. Making this incremental change may alleviate the immediate congestion problems until the longer term goals and objectives can

be determined. The impact of such a reduction would be felt on many weekend days throughout the summer. Most weekdays would not be affected. At low water levels anticipated use would be below the capacity judging from the experience in 1992. Only a few weekends would be affected when water level is dramatically low. A proposed capacity table is shown in Table 13 which simplifies the allowed boat numbers in Alternative #2.

Table 13. Proposed Boating Capacity, Pineview Reservoir

Water Level	Number of Boats
4900	400
4890	300
4880	250
4870	200
4860	150
4850	100

The adjusted numbers reflect rounding to ease administration and aid public understanding. While boating patterns are not fully understood this capacity would recognize that not all boats are on the water at one time. Boating dispersal would be between 7.5 and 10 acres per boat as a result of this strategy. Until more information is gathered management should accept some congestion and crowding. Increased public education, boating patrols and improved signing can all help alleviate the short term impacts of high use levels.

VIII. BOATING CAPACITY IMPLEMENTATION

A. Proposed Policy

Implementing any recreation capacity is an ambitious undertaking. The policy applied in 1992 has not withstood the test of time or angry publics. However, with some modifications, it could form the foundation for this coming summer. The key features of the modified policy are described below. Even if no change in the capacity is made the remaining portions of this policy could still be implemented.

Pineview Reservoir Boating Capacity Policy - **PROPOSED**

- Allocation of launches will continue on a first-come first served basis.

- The maximum number of vessels on the reservoir at any one time will be 430. The public launch number will drop by 100 for the first 10 foot drop in water level. The total number will drop by an additional fifty vessels with each ten foot drop in the reservoir water level starting with the twenty foot mark. The Yacht Club boaters would have a vessel allocation on the weekends, holidays and whenever capacity limits are reached at the public ramps, amounting to 30 vessels at high water. They would be reduced by 5 vessels for each drop in water level.

- The allocation of boats on the water at the various water levels is shown below:

Pineview Reservoir Capacity Limits, No. of Vessels at One Time

Water Level	Boat Ramps	Yacht Club
4900	400	30
4890	300	25
4880	250	20
4870	200	15
4860	150	10
4850	100	10

- The boat ramps would be closed sometime after the 4850 level is reached because of obstructions in the reservoir, low water and anticipated low visitor levels.

- The number of boats launched will be counted on a daily basis during the peak use season from Memorial Day weekend to Labor Day weekend. The count will include boats, personal water craft, and boats in wet storage launching from Port Ramp, the Marina Ramp, and the Ogden Yacht Club.

- Capacity limits will be implemented in the following manner. Each morning the number of boats on the Reservoir will be assessed by counting the number of boat trailers at each boat ramp parking lot and at Anderson Cove Campground. Then as vessels are launched during the day a cumulative tally will be kept. When the capacity figure is reached for the given water level, launching from the boat ramps at Port Ramp and Cemetery Point will be curtailed. A waiting area will be established for access to the Reservoir on a first-come, first-served basis. As a vessel is removed from the water, a waiting vessel will be allowed to launch. If waiting vehicles exceed parking space, parking barriers will be placed to close access to the ramps. These barriers will be removed when parking becomes available. Vehicles arriving after this time would need to drive to the nearest parking area to either wait for an opening or leave for a different area. Each ramp will operate independently when capacity is reached, ie. before a boat can launch from Port Ramp a boat must be removed from the water at Port Ramp. Visitor count forms and instructions for daily and weekly tabulations are found in Appendix B. A capacity worksheet is also included.

- All motorized vessels count against the boating capacity. Personal watercraft, like JetSki's, Waverunners, and similar craft, all count as one vessel against the capacity. Sailboarding, kayaking, rafting, canoeing and other nonmotorized vessel use, except sailboating, will not be counted in the calculations for recreation capacity. These uses typically occur in the wakeless speed areas where conflicts with motorized use are minimal. The Forest Service will monitor monmotorized use and take additional action as needed.

- Each personal watercraft will be charged a launch fee commensurate with the fee other boaters pay for each vessel launched. Because each personal watercraft counts against the total of vessels allowed on the reservoir, each watercraft should be charged a fee.

- The capacity limits will be monitored each season. Future adjustments in capacity either up or down will be based on recorded visits, total recorded near misses, number of reported accidents, visitor complaints and professional judgment of both the Forest Service and Utah Parks and Recreation Staff.

- A phone number will be established and publicized where boaters may learn the current number of boats on the reservoir.

- Maintain the existing zoned waters:

  A wakeless speed area in Spring Cove (located in cove west of Gertsen Bay).

  A wakeless speed area beginning at the Marina Ramp and extending west to the southwestern most point of Cemetery point.

  A wildlife quiet area closed to motorized vessels in a portion of the North Arm (electric motors allowed).

- Marked buoys clearly defining the types of use for all zoned areas will be set in place.

- An informational facility will be constructed at both Port and Marina Ramp's and a self serve informational office will be set up at Anderson Cove Campground to disperse boater information and education materials.

- Boater education courses will be promoted by the Forest Service & Utah State Park and Recreation.

- The Forest Service will review water quality monitoring results by the County Board of Health and determine what actions might be needed in the swim areas and on the reservoir to maintain public health. A public sewage waste facility will be constructed at Port Ramp. Funding for this project will be provided by Federal funds or other grant money.

B. Action Steps Required

An Environmental Assessment to document National Environmental Policy Act (NEPA) compliance would be required to implement the proposed policy. The proposed carrying capacity policy, including new capacity limits, would need public review and analysis through an interdisciplinary team process. The deciding official would be the District Ranger.

Regardless of whether the new capacity levels are adopted the remainder of the policy could be implemented. Tasks and due dates to fully realize the benefits of this policy include:

Due Date	Description of Task
May 1	Begin publicity campaign to increase awareness of current capacity limits on the reservoir. Target goal: three newspaper stories and one TV report before Memorial Day.
May 1	Arrange patrol schedules to monitor capacity on weekends. Ensure coverage at each ramp during the month of May and June.
May 1	Arrange for call in phone #.
May 15	Provide training to concessionaire employees on the rationale of the capacity and the process steps to implement.
May 15	Finalize Pineview Reservoir brochure, print and distribute to boat ramps, boating suppliers, sporting good stores and Forest offices.
May 15	Install visitor information kiosks at Port and Cemetery Point Ramps. Include a map of the reservoir showing new zones.
June 1	Review Visitor Count forms and procedures with concessionaires. Make adjustments as necesary.
June 1	Establish aerial visitor count schedule. Coordinate with RO Eng to piggy-back on other photo flights into and out of Ogden airport in order to reduce cost.
July 1	Review CUSTOMER results and incorporate findings into capacity strategy.
Sept 30	Total visitor use counts. Determine boating turnover, occupancy rates and total use.
Oct 30	Annually review season of operation. Revise policy, procedures and capacity as necessary.

C. Additional Topics for Research

Besides limitations from the impacts of visitor use, capacity at Pineview is constrained by the amount of water, amount of land for access and physical attributes of the reservoir. Types of uses can also affect capacity.

The Forest Service does not control the water in Pineview Reservoir. Shares are owned by the Pineview Water users Association and the Weber Basin Water Conservancy District. First priority for the water is irrigation for farmers and residents of Weber and Davis Counties. Typically the reservoir is drawn down 20-40 feet each year hampering recreation. Research into purchase of portions of these shares to maintain

a conservation pool for boating may prove fruitful. Additional water would help keep capacity higher. Procedures are in place to purchase the water shares if the money is available (Smith 1990).

Several parcels around Pineview are currently vacant and available for purchase. Acquisition of these parcels would provide for future expansion of existing campgrounds and launch areas. Alternative access to the reservoir for day use activities could be developed. Providing other recreation opportunities to boating may reduce numbers on the reservoir.

Many banks around the reservoir are steep and eroding. While expanding the reservoir is impractical some small gains could be made by cutting some banks back to stabilize them. This would allow more bank shoreline for beach activities and correct safety hazards.

Developing attractions around the reservoir in under utilized areas may reduce congestion. Distributing boaters by creating new places to visit could spread out people. Boating platforms, developed campsites and boat only beach access should be considered.

There is a continual request for additional commercial operations on and around Pineview. These include parasailing, boat rentals, party boats and scuba diving. Restricting all commercial uses to those offered through the concessionaire should seriously be examined. The types of uses offered by the concessionaire should be evaluated against the amount of additional traffic they would create.

Pineview Yacht Club is a long term special use. As boating restrictions are placed on Pineview the role and relationship of the Yacht Club to providing public benefits should be examined. Allocation of a portion of available launches to the Yacht Club will continue to be scrutinized and criticized by the general public.

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Appendix A

APPENDIX A

Table A1-1	Comparison of Digitized Acres with Published Acres
Table A2-1	Number of Boats Allowed at Given Boating Capacity Standard, Elevation and Zone, .5 to 3 acres/boat
Table A2-2	Number of Boats Allowed at Given Boating Capacity Standard, Elevation and Zone, 4 to 17.5 acres/boat
Table A2-3	Number of Boats Allowed at Given Boating Capacity Standard, Elevation and Zone, 20 to 50 acres/boat
Table A2-4	Summary of Number of Boats Allowed at Given Boating Capacity Standard for each Zone
Table A2-5	Alternative Analysis - Current Situation Analysis
Table A2-6	Alternative Analysis - Wakeless Zone Sensitivity
Table A2-7	Alternative Analysis - Power Boating Standard Alternative
Table A2-8	Alternative Analysis - Waterskiing Standard Alternative
Table A2-9	Alternative Analysis - Highly Restrictive Management Alternative

Table A1-1

Comparison of Digitized Acres with Published Acres[1]

Elevation	PolyGon Acres	Cummulative Acres	Published Acres	Difference
4820	21.0	21.0	13	8
4825	91.0	112.1	107	5
4830	211.1	323.1	326	2
4835	140.0	463.2	476	-13
4840	169.2	632.4	630	2
4845	149.4	781.8	783	-2
4850	189.1	970.9	970	1
4855	164.2	1,135.1	1,134	1
4860	197.1	1,332.2	1,329	3
4865	190.1	1,522.3	1,521	1
4870	189.0	1,711.3	1,710	1
4875	183.4	1,894.7	1,896	-2
4880	202.6	2,097.3	2,092	5
4885	227.2	2,324.5	2,314	10
4890	232.0	2,556.5	2,538	18
4895	218.6	2,775.1	2,760	15
4900	236.8	3,011.9	2,874	137

[1] Source:

Pineview Reservoir, Ogden River Project, Weber Basin Project, Weber Basin Water Conservancy District.

Table A2-1
Number of Boats Allowed
at Given Boating Capacity Standard,
Elevation and Zone
.5 to 3.5 Acres/Boat

ZONE	ELEVATION	Acres	STD .5	STD 1	STD 1.5	STD 2	STD 2.5	STD 3	STD 3.5
Closed	4820	0.3	0.6	0.3	0.2	0.2	0.1	0.1	0.1
	4825	0.5	1.0	0.5	0.3	0.3	0.2	0.2	0.1
	4830	0.2	0.4	0.2	0.1	0.1	0.1	0.1	0.1
	4835	0.2	0.4	0.2	0.1	0.1	0.1	0.1	0.1
	4840	0.2	0.4	0.2	0.1	0.1	0.1	0.1	0.1
	4845	0.2	0.4	0.2	0.1	0.1	0.1	0.1	0.1
	4850	0.3	0.6	0.3	0.2	0.2	0.1	0.1	0.1
	4855	1.3	2.6	1.3	0.9	0.7	0.5	0.4	0.4
	4860	1.0	2.0	1.0	0.7	0.5	0.4	0.3	0.3
	4865	0.8	1.6	0.8	0.5	0.4	0.3	0.3	0.2
	4870	0.9	1.8	0.9	0.6	0.5	0.4	0.3	0.3
	4875	1.5	3.0	1.5	1.0	0.8	0.6	0.5	0.4
	4880	4.5	9.0	4.5	3.0	2.3	1.8	1.5	1.3
	4885	8.1	16.2	8.1	5.4	4.1	3.2	2.7	2.3
	4890	7.8	15.6	7.8	5.2	3.9	3.1	2.6	2.2
	4895	3.8	7.6	3.8	2.5	1.9	1.5	1.3	1.1
	4900	4.1	8.2	4.1	2.7	2.1	1.6	1.4	1.2
Motorized	4825	31.1	62.2	31.1	20.7	15.6	12.4	10.4	8.9
	4830	191.8	383.6	191.8	127.9	95.9	76.7	63.9	54.8
	4835	132.8	265.6	132.8	88.5	66.4	53.1	44.3	37.9
	4840	156.6	313.2	156.6	104.4	78.3	62.6	52.2	44.7
	4845	124.0	248.0	124.0	82.7	62.0	49.6	41.3	35.4
	4850	162.7	325.4	162.7	108.5	81.4	65.1	54.2	46.5
	4855	151.8	303.6	151.8	101.2	75.9	60.7	50.6	43.4
	4860	187.8	375.6	187.8	125.2	93.9	75.1	62.6	53.7
	4865	181.1	362.2	181.1	120.7	90.6	72.4	60.4	51.7
	4870	178.1	356.2	178.1	118.7	89.1	71.2	59.4	50.9
	4875	169.9	339.8	169.9	113.3	84.9	68.0	56.6	48.5
	4880	165.1	330.2	165.1	110.1	82.6	66.0	55.0	47.2
	4885	175.9	351.8	175.9	117.3	88.0	70.4	58.6	50.3
	4890	174.1	348.2	174.1	116.1	87.1	69.6	58.0	49.7
	4895	157.0	314.0	157.0	104.7	78.5	62.8	52.3	44.9
	4900	152.4	304.8	152.4	101.6	76.2	61.0	50.8	43.5
Nonmotorized	4875	0.4	0.8	0.4	0.3	0.2	0.2	0.1	0.1
	4880	18.9	37.8	18.9	12.6	9.5	7.6	6.3	5.4
	4885	24.1	48.2	24.1	16.1	12.1	9.6	8.0	6.9
	4890	32.2	64.4	32.2	21.5	16.1	12.9	10.7	9.2
	4895	33.7	67.4	33.7	22.5	16.9	13.5	11.2	9.6
	4900	27.0	54.0	27.0	18.0	13.5	10.8	9.0	7.7
Unuseable	4890	1.1	2.2	1.1	0.7	0.6	0.4	0.4	0.3
	4895	3.6	7.2	3.6	2.4	1.8	1.4	1.2	1.0
	4900	9.6	19.2	9.6	6.4	4.8	3.8	3.2	2.7
Wakeless	4820	20.7	41.4	20.7	13.8	10.4	8.3	6.9	5.9
	4825	59.5	119.0	59.5	39.7	29.8	23.8	19.8	17.0
	4830	19.2	38.4	19.2	12.8	9.6	7.7	6.4	5.5
	4835	6.9	13.8	6.9	4.6	3.5	2.8	2.3	2.0
	4840	12.4	24.8	12.4	8.3	6.2	5.0	4.1	3.5
	4845	25.2	50.4	25.2	16.8	12.6	10.1	8.4	7.2
	4850	26.2	52.4	26.2	17.5	13.1	10.5	8.7	7.5
	4855	11.2	22.4	11.2	7.5	5.6	4.5	3.7	3.2
	4860	8.4	16.8	8.4	5.6	4.2	3.4	2.8	2.4
	4865	8.1	16.2	8.1	5.4	4.1	3.2	2.7	2.3
	4870	10.2	20.4	10.2	6.8	5.1	4.1	3.4	2.9
	4875	11.5	23.0	11.5	7.7	5.8	4.6	3.8	3.3
	4880	14.1	28.2	14.1	9.4	7.1	5.6	4.7	4.0
	4885	19.1	38.2	19.1	12.7	9.6	7.6	6.4	5.5
	4890	16.9	33.8	16.9	11.3	8.5	6.8	5.6	4.8
	4895	20.5	41.0	20.5	13.7	10.3	8.2	6.8	5.9
	4900	32.3	64.6	32.3	21.5	16.2	12.9	10.8	9.2
TOTALS		3000.9	6001.8	3000.9	2000.8	1501.9	1200.2	1000.1	857.4

Table A2-2
Number of Boats Allowed
at Given Boating Capacity Standard,
Elevation and Zone
4 to 17.5 Acres/Boat

ZONE	ELEVATION	Acres	STD 4	STD 4.5	STD 5	STD 7.5	STD 10	STD12.5	STD 15	STD17.5
Closed	4820	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	4825	0.5	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
	4830	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4835	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4840	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4845	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4850	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	4855	1.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1
	4860	1.0	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	4865	0.8	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0
	4870	0.9	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	4875	1.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1	0.1
	4880	4.5	1.1	1.0	0.9	0.6	0.5	0.4	0.3	0.3
	4885	8.1	2.0	1.8	1.6	1.1	0.8	0.6	0.5	0.5
	4890	7.8	2.0	1.7	1.6	1.0	0.8	0.6	0.5	0.4
	4895	3.8	1.0	0.8	0.8	0.5	0.4	0.3	0.3	0.2
	4900	4.1	1.0	0.9	0.8	0.5	0.4	0.3	0.3	0.2
Motorized	4825	31.1	7.8	6.9	6.2	4.1	3.1	2.5	2.1	1.8
	4830	191.8	47.9	42.6	38.4	25.6	19.2	15.3	12.8	11.0
	4835	132.8	33.2	29.5	26.6	17.7	13.3	10.6	8.9	7.6
	4840	156.6	39.2	34.8	31.3	20.9	15.7	12.5	10.4	8.9
	4845	124.0	31.0	27.6	24.8	16.5	12.4	9.9	8.3	7.1
	4850	162.7	40.7	36.2	32.5	21.7	16.3	13.0	10.8	9.3
	4855	151.8	38.0	33.7	30.4	20.2	15.2	12.1	10.1	8.7
	4860	187.8	47.0	41.7	37.6	25.0	18.8	15.0	12.5	10.7
	4865	181.1	45.3	40.2	36.2	24.1	18.1	14.5	12.1	10.3
	4870	178.1	44.5	39.6	35.6	23.7	17.8	14.2	11.9	10.2
	4875	169.9	42.5	37.8	34.0	22.7	17.0	13.6	11.3	9.7
	4880	165.1	41.3	36.7	33.0	22.0	16.5	13.2	11.0	9.4
	4885	175.9	44.0	39.1	35.2	23.5	17.6	14.1	11.7	10.1
	4890	174.1	43.5	38.7	34.8	23.2	17.4	13.9	11.6	9.9
	4895	157.0	39.3	34.9	31.4	20.9	15.7	12.6	10.5	9.0
	4900	152.4	38.1	33.9	30.5	20.3	15.2	12.2	10.2	8.7
Nonmotorized	4875	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	4880	18.9	4.7	4.2	3.8	2.5	1.9	1.5	1.3	1.1
	4885	24.1	6.0	5.4	4.8	3.2	2.4	1.9	1.6	1.4
	4890	32.2	8.1	7.2	6.4	4.3	3.2	2.6	2.1	1.8
	4895	33.7	8.4	7.5	6.7	4.5	3.4	2.7	2.2	1.9
	4900	27.0	6.8	6.0	5.4	3.6	2.7	2.2	1.8	1.5
Unuseable	4890	1.1	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	4895	3.6	0.9	0.8	0.7	0.5	0.4	0.3	0.2	0.2
	4900	9.6	2.4	2.1	1.9	1.3	1.0	0.8	0.6	0.5
Wakeless	4820	20.7	5.2	4.6	4.1	2.8	2.1	1.7	1.4	1.2
	4825	59.5	14.9	13.2	11.9	7.9	6.0	4.8	4.0	3.4
	4830	19.2	4.8	4.3	3.8	2.6	1.9	1.5	1.3	1.1
	4835	6.9	1.7	1.5	1.4	0.9	0.7	0.6	0.5	0.4
	4840	12.4	3.1	2.8	2.5	1.7	1.2	1.0	0.8	0.7
	4845	25.2	6.3	5.6	5.0	3.4	2.5	2.0	1.7	1.4
	4850	26.2	6.6	5.8	5.2	3.5	2.6	2.1	1.7	1.5
	4855	11.2	2.8	2.5	2.2	1.5	1.1	0.9	0.7	0.6
	4860	8.4	2.1	1.9	1.7	1.1	0.8	0.7	0.6	0.5
	4865	8.1	2.0	1.8	1.6	1.1	0.8	0.6	0.5	0.5
	4870	10.2	2.6	2.3	2.0	1.4	1.0	0.8	0.7	0.6
	4875	11.5	2.9	2.6	2.3	1.5	1.2	0.9	0.8	0.7
	4880	14.1	3.5	3.1	2.8	1.9	1.4	1.1	0.9	0.8
	4885	19.1	4.8	4.2	3.8	2.5	1.9	1.5	1.3	1.1
	4890	16.9	4.2	3.8	3.4	2.3	1.7	1.4	1.1	1.0
	4895	20.5	5.1	4.6	4.1	2.7	2.1	1.6	1.4	1.2
	4900	32.3	8.1	7.2	6.5	4.3	3.2	2.6	2.2	1.8
TOTALS		3000.9	750.9	666.9	600.0	399.8	300.2	239.8	200.1	171.4

Table A2-3
Number of Boats Allowed
at Given Boating Capacity Standard,
Elevation and Zone
20 to 50 Acres/Boat

ZONE	ELEVATION	Acres	STD 20	STD 22.5	STD25	STD 30	STD 35	STD40	STD45	STD 50
Closed	4820	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4825	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4830	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4835	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4840	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4845	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4850	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4855	1.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
	4860	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4865	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4870	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4875	1.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	4880	4.5	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
	4885	8.1	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
	4890	7.8	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2
	4895	3.8	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
	4900	4.1	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Motorized	4825	31.1	1.6	1.4	1.2	1.0	0.9	0.8	0.7	0.6
	4830	191.8	9.6	8.5	7.7	6.4	5.5	4.8	4.3	3.8
	4835	132.8	6.6	5.9	5.3	4.4	3.8	3.3	3.0	2.7
	4840	156.6	7.8	7.0	6.3	5.2	4.5	3.9	3.5	3.1
	4845	124.0	6.2	5.5	5.0	4.1	3.5	3.1	2.8	2.5
	4850	162.7	8.1	7.2	6.5	5.4	4.6	4.1	3.6	3.3
	4855	151.8	7.6	6.7	6.1	5.1	4.3	3.8	3.4	3.0
	4860	187.8	9.4	8.3	7.5	6.3	5.4	4.7	4.2	3.8
	4865	181.1	9.1	8.0	7.2	6.0	5.2	4.5	4.0	3.6
	4870	178.1	8.9	7.9	7.1	5.9	5.1	4.5	4.0	3.6
	4875	169.9	8.5	7.6	6.8	5.7	4.9	4.2	3.8	3.4
	4880	165.1	8.3	7.3	6.6	5.5	4.7	4.1	3.7	3.3
	4885	175.9	8.8	7.8	7.0	5.9	5.0	4.4	3.9	3.5
	4890	174.1	8.7	7.7	7.0	5.8	5.0	4.4	3.9	3.5
	4895	157.0	7.9	7.0	6.3	5.2	4.5	3.9	3.5	3.1
	4900	152.4	7.6	6.8	6.1	5.1	4.4	3.8	3.4	3.0
Nonmotorized	4875	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4880	18.9	0.9	0.8	0.8	0.6	0.5	0.5	0.4	0.4
	4885	24.1	1.2	1.1	1.0	0.8	0.7	0.6	0.5	0.5
	4890	32.2	1.6	1.4	1.3	1.1	0.9	0.8	0.7	0.6
	4895	33.7	1.7	1.5	1.3	1.1	1.0	0.8	0.7	0.7
	4900	27.0	1.4	1.2	1.1	0.9	0.8	0.7	0.6	0.5
Unuseable	4890	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4895	3.6	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
	4900	9.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2
Wakeless	4820	20.7	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4
	4825	59.5	3.0	2.6	2.4	2.0	1.7	1.5	1.3	1.2
	4830	19.2	1.0	0.9	0.8	0.6	0.5	0.5	0.4	0.4
	4835	6.9	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
	4840	12.4	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.2
	4845	25.2	1.3	1.1	1.0	0.8	0.7	0.6	0.6	0.5
	4850	26.2	1.3	1.2	1.0	0.9	0.7	0.7	0.6	0.5
	4855	11.2	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
	4860	8.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
	4865	8.1	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
	4870	10.2	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2
	4875	11.5	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2
	4880	14.1	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3
	4885	19.1	1.0	0.8	0.8	0.6	0.5	0.5	0.4	0.4
	4890	16.9	0.8	0.8	0.7	0.6	0.5	0.4	0.4	0.3
	4895	20.5	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4
	4900	32.3	1.6	1.4	1.3	1.1	0.9	0.8	0.7	0.6
TOTALS		3000.9	150.1	133.1	120.0	99.8	85.3	74.9	66.9	59.8

Table A2-4
Summary of
Number of Boats Allowed
at Given Boating Capacity Standard
For each Zone

.5 to 3.5 Acres/Boat

ZONE	Acres	STD .5	STD 1	STD 1.5	STD 2	STD 2.5	STD 3	STD 3.5
Closed	35.7	71.4	35.7	23.6	18.3	14.2	12.1	10.4
Motorized	2492.2	4984.4	2492.2	1661.6	1246.4	996.7	830.6	712.0
NonMotorized	136.3	272.6	136.3	91.0	68.3	54.6	45.3	38.9
Unuseable	14.3	28.6	14.3	9.5	7.2	5.6	4.8	4.0
Wakeless	322.4	644.8	322.4	215.1	161.7	129.1	107.3	92.1
TOTALS	3000.9	6001.8	3000.9	2000.8	1501.9	1200.2	1000.1	857.4

4 to 17.5 Acres/Boat

ZONE	Acres	STD 4	STD 4.5	STD 5	STD 7.5	STD 10	STD12.5	STD 15	STD17.5
Closed	35.7	9.2	7.7	7.2	4.5	3.6	2.7	2.4	2.0
Motorized	2492.2	623.3	553.9	498.5	332.1	249.3	199.2	166.2	142.4
NonMotorized	136.3	34.1	30.4	27.2	18.2	13.6	10.9	9.0	7.7
Unuseable	14.3	3.6	3.1	2.8	1.9	1.5	1.2	0.9	0.8
Wakeless	322.4	80.7	71.8	64.3	43.1	32.2	25.8	21.6	18.5
TOTALS	3000.9	750.9	666.9	600.0	399.8	300.2	239.8	200.1	171.4

20 to 50 Acres/Boat

ZONE	Acres	STD 20	STD 22.5	STD25	STD 30	STD 35	STD40	STD45	STD 50
Closed	35.7	1.7	1.5	1.4	1.1	0.7	0.7	0.7	0.7
Motorized	2492.2	124.7	110.6	99.7	83.0	71.3	62.3	55.7	49.8
NonMotorized	136.3	6.8	6.0	5.5	4.5	3.9	3.4	2.9	2.7
Unuseable	14.3	0.8	0.6	0.5	0.4	0.4	0.3	0.3	0.3
Wakeless	322.4	16.1	14.4	12.9	10.8	9.0	8.2	7.3	6.3
TOTALS	3000.9	150.1	133.1	120.0	99.8	85.3	74.9	66.9	59.8

Table A2-5
Alternative Analysis

Current Situation Analysis

Assumptions									
Start Elevation		4900	4900	4895	4890	4880	4870	4860	4850
Useable Elevation		4900	4895	4885	4880	4870	4860	4850	4840
Motorized Standard		7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Wakeless Standard		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	Acres	Allowed Boats							
Unuseable	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Closed	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motorized	2492.2	332.1	311.8	267.7	244.2	199.5	151.7	106.5	68.3
Wakeless	322.4	64.3	57.8	50.3	46.5	41.4	37.8	33.9	23.7
NonMotorized	136.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	3000.9	396.4	369.6	318.0	290.7	240.9	189.5	140.4	92.0

Table A2-6
Alternative Analysis

Wakeless Zone Sensitivity

		Alternatives	
Assumptions		#1	#2
Start Elevation		4900	4900
Useable Elevation		4900	4900
Motorized Standard		7.5	7.5
Wakeless Standard		2.5	7.5
	Acres	Allowed Boats	
Unuseable	14.3	0.0	0.0
Closed	35.7	0.0	0.0
Motorized	2492.2	332.1	332.1
Wakeless	322.4	129.1	43.1
NonMotorized	136.3	0.0	0.0
TOTALS	3000.9	461.2	375.2

Table A2-7
Alternative Analysis

Power Boating Standard Alternative

Assumptions

Start Elevation		4900	4890	4880	4870	4860	4850
Useable Elevation		4890	4880	4870	4860	4850	4840
Motorized Standard		15.0	15.0	15.0	15.0	15.0	15.0
Wakeless Standard		5.0	5.0	5.0	5.0	5.0	5.0
	Acres	Allowed Boats					
Unuseable	14.3	0.0	0.0	0.0	0.0	0.0	0.0
Closed	35.7	0.0	0.0	0.0	0.0	0.0	0.0
Motorized	2492.2	145.5	122.2	99.9	75.9	53.3	34.2
Wakeless	322.4	53.7	46.5	41.4	37.8	33.9	23.7
NonMotorized	136.3	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	3000.9	199.2	168.7	141.3	113.7	87.2	57.9

Table A2-8
Alternative Analysis

Waterskiing Standard Alternative

Assumptions

Start Elevation		4900	4890	4880	4870	4860	4850
Useable Elevation		4890	4880	4870	4860	4850	4840
Motorized Standard		30.0	30.0	30.0	30.0	30.0	30.0
Wakeless Standard		5.0	5.0	5.0	5.0	5.0	5.0
	Acres	Allowed Boats					
Unuseable	14.3	0.0	0.0	0.0	0.0	0.0	0.0
Closed	35.7	0.0	0.0	0.0	0.0	0.0	0.0
Motorized	2492.2	72.7	61.0	49.8	37.9	26.5	17.0
Wakeless	322.4	53.7	46.5	41.4	37.8	33.9	23.7
NonMotorized	136.3	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	3000.9	126.4	107.5	91.2	75.7	60.4	40.7

Table A2-9
Alternative Analysis

Highly Restrictive Management Alternative

Assumptions

Start Elevation		4900	4890	4880	4870	4860	4850
Useable Elevation		4890	4880	4870	4860	4850	4840
Motorized Standard		40.0	40.0	40.0	40.0	40.0	40.0
Wakeless Standard		5.0	5.0	5.0	5.0	5.0	5.0
	Acres	Allowed Boats					
Unuseable	14.3	0.0	0.0	0.0	0.0	0.0	0.0
Closed	35.7	0.0	0.0	0.0	0.0	0.0	0.0
Motorized	2492.2	54.6	45.8	37.5	28.5	20.0	12.8
Wakeless	322.4	53.7	46.5	41.4	37.8	33.9	23.7
NonMotorized	136.3	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	3000.9	108.3	92.3	78.9	66.3	53.9	36.5

Appendix B

APPENDIX B

1. Daily Visitor Count Form

2. Weekly Visitor Count Form

3. Capacity Worksheet

OGDEN RANGER DISTRICT
Wasatch-Cache National Forest

PINEVIEW RESERVOIR
DAILY VISITOR COUNT FORM

Date: _____ Location: Port Ramp ____ Cemetery Point ____

Number of Boat Trailers
Remaining in Lot Overnight **A.** _____

	B. No. of Boats Launched From Ramp		**C. No. of Boats Launched From Wet Storage**		**D. No. of Boats Leaving Site**		**E. Total Boats on Reservoir**
Hour	By Hour	Cum Total	By Hour	Cum Total	By Hour	Cum Total	
7:00 am							
8:00 am							
9:00 am							
10:00 am							
11:00 am							
12 noon							
1:00 pm							
2:00 pm							
3:00 pm							
4:00 pm							
5:00 pm							
6:00 pm							
7:00 pm							
8:00 pm							

TOTALS				

Instructions:

1. Each morning count the number of boat trailers currently parked in the lot. Enter at **A.**
2. Count each boat brought through the gate during the day. Enter in column **B.** by hour. Add previous hours for cummulative total.
3. Count each boat launched from wet storage. Enter in column **C.** by hour. Add previous hours for cummulative total.
4. Count each boat leaving through the gate during the day. Enter in column **D.** by hour. Add previous hours for cummulative total.
5. Add **A.** to cummulative total for columns **B.** and **C.** and then subtract column **D.** Enter result in Column **E.**
6. Enter cummulative totals for each day at bottom of the form. They will be used on the Weekly Summary Form.

OGDEN RANGER DISTRICT
Wasatch-Cache National Forest

PINEVIEW RESERVOIR
WEEKLY VISITOR COUNT SUMMARY

Date: _____ Location: Port Ramp ____ Cemetery Point ____

Hour	A. No. of Boat Trailers Remaining Overnight	B. No. of Boats Launched From Ramp	C. No. of Boats Launched From Wet Storage	D. Total Launched	E. Parking Fee Only
Monday					
Tuesday					
Wednesday					
Thrusday					
Friday					
Saturday					
Sunday					
TOTALS					

Instructions:

1. Weekly summarize the information in Columns **A., B., C.,** and **D.** from the Daily Visitor Count Form into the appropriate columns on this form.
2. Column **E.** "Parking Only" information comes from cash register receipts for the week.

OGDEN RANGER DISTRICT
Wasatch-Cache National Forest

PINEVIEW RESERVOIR
CAPACITY WORKSHEET

Date: _____

A. Water Level: _____

CURRENT BOATING CAPACITY TABLE

Water Level	Allowed Number of Boat Launches from Public Ramps	Allowed number of Launches from Yacht Club	Total Allowed Launches
4900	400	30	430
4880	350	25	375
4870	300	20	320
4860	250	15	265
4850	Ramps Close		

Note: Yacht Club will self administer their limit on weekends and holidays.

Hour	B. Boats on Reservoir from Port Ramp	C. Boats on Reservoir from Cemetery Point	D. Total Boats on Reservoir
9:00 am			
10:00 am			
11:00 am			
12 noon			
1:00 pm			
2:00 pm			
3:00 pm			
4:00 pm			
5:00 pm			
6:00 pm			

Instructions:

1. Each morning determine water level for the day. Enter at **A.**
2. Hourly contact Port and Cemetery Point Ramps to determine the number of boats on the reservoir. Enter result in columns **B.** and **C.** and add total to column **D.**
3. When within 30 boats of capacity limit call Forest Service office and notify them of possible closure.
4. When within 5 boats of capacity limit post sign at entrance of each boat ramp notifying public of ramp closure.
5. When capacity limit is reached, each new boat is required to wait until a boat is removed from the reservoir before launching. Direct incoming boats to the waiting area. Post a person to direct launches at head of ramp.
6. When the current number of boats drops 10 vessels below the capacity remove signs from the entrance of each boat ramp.